

A Vegetative Key to Wetland Plants

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and
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Draft

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Introduction

PondNet is national volunteer survey network which aims to collect information about trends in pond quality and pond species, including rare plants and animals.

Pond quality monitoring is based on PSYM (**P**redictive **S**ystem for **M**ultimetrics) surveys. This standard method provides an assessment of the ecological quality of a site compared to ponds nationally. It requires basic environmental information and, as a minimum, the identification of all the wetland plant species found in the pond. You can find out more about the methodology here: <https://freshwaterhabitats.org.uk/projects/surveys/psym-method>.

The accuracy with which PSYM scores are calculated and for consistency of monitoring between years, the survey is reliant on accurate identification of plant species. Therefore we recommend that only experienced botanist carry out the survey.

During the HLF funded People, Ponds and Water project we ran a series of wetland plant identification workshops to help beginners on their learning journey, but many commented that the keys were very technical, or covered species they were not likely to encounter, or that they relied too much on flowers which can be inconspicuous or absent for much of the year.

The Vegetative Key to the British Flora by John Poland and Eric Element <https://www.amazon.co.uk/Vegetative-Key-British-Flora/dp/0956014402> published in 2009 has become an essential tool for field botanists. Unlike conventional guides which often rely on the characteristics of flowers or fruit, the vegetative key relies on other plant characteristics; ones that can be found throughout the growing season. The novel structure of the key also allows the relative beginner to be able to correctly identify a plant in just a few steps.

With funding from the Heritage Lottery, Freshwater Habitats Trust approached John Poland to produce a concise version of the Vegetative Key; a version which would only include the wetland plant species relevant to PSYM.

How to get involved

We want the 'Vegetative Key to Wetland Plants', to be a useful tool for anyone wanting to learn new identification skills.

We've produced a draft version initially, in the hope that beginners, intermediate and experienced botanists will try using the key during 2019 and provide feedback through the Wetland Veg Key Facebook Forum which can be found through Freshwater Habitats Trust's home page: www.facebook.com/freshwaterhabitatstrust.

Suggested feedback:

- I've noticed an error in the formatting on page ..
- I found it difficult to understand the description of the characteristic on page .., line ..
- I think this part of the key isn't working because I have not identified the right species to the plant I know I have found.
- I'd like this term to be explained in the glossary.
- It would be useful to have this picture in the image gallery.
- Positive feedback would also be gratefully received!

How to use the key

The key is divided into groups A-Z. Initial choices (page 3) should be easy to make and will involve looking at obvious characteristics. See notes below on how to choose a good specimen.

The key is not dichotomous (i.e. a choice between two options – as in many plant keys). There may be one, two, three or more choices (polychotomous). It is therefore important to read all the choices before making a decision.

To help you follow the key, each option is indented:

- **The initial choice:** In the key to groups (page 3), there are only three options you need to choose between – leaves submerged; leaves floating; or leaves emergent. Later in the key it is important that you take note of all the possible choices within each group.
- ◆ **Second level choices:** Remember there may be one, two, three or more choices below the initial choice. You will need to read all options, often with several characteristics required to make your decision about where you should go next in the key.
- **Third level choices:** As above, there may be one or more choices, care should be taken not to miss widely-spaced options.
- **Fourth level choices:** There may be further levels of choices below this, and these will be clearly indicated by an indent.

Collecting your plant

Choose a typical specimen, and where possible, look at several plants to confirm that your sample is representative.

To use the key effectively, choose a basal or lower stem leaf (unless instructed otherwise); leaves from the mid-stem can be completely different and may be misleading. The key is not designed to identify seedlings and at least one typical well-developed leaf must be present for it to work. It should be possible to identify all characteristics using a x20 hand lens (or loupe).

It is against the law to uproot any wild plant in Britain without the permission of the landowner, but picking the odd leaf or part of a plant to aid identification is unlikely to damage any plant population in the wider countryside. Some very rare plants are included under Schedule 8 of the Wildlife and Countryside Act 1981 (as amended) making it illegal to collect any part of the plant. The key includes Sch 8 next to these plants, to help the reader make an informed choice about what to collect. Most of these rarities will be found within protected sites where the presence of these very plants is usually well known.

Please be aware of the Health and Safety risks associated with working around any waterbody, and even more so, the potential for people to carry amphibian and other diseases and invasive non-native species inadvertently between ponds. Look after yourself and look after your pond. You can find more information here:

<https://freshwaterhabitats.org.uk/projects/pondnet/volunteer-starter-pack>.

Key to Groups

- Lvs submerged
 - ◆ Lvs in basal rosette (fragments may be washed up on shoreline) **A**
 - ◆ Lvs not in basal rosette
 - Lvs whorled or pseudowhorled (spiralling around stem) **B**
 - Lvs opp **C**
 - Lvs alt
 - Lvs simple and unlobed (may be entire or toothed)
 - Lvs with pinnate veins, large and crumpled like lettuce leaf **D**
 - Lvs with parallel veins
 - Lvs with spiral fibres visible on tearing, 3-5 equal parallel veins. Sea water **E**
 - Lvs without spiral fibres on tearing, 1-11 unequal parallel veins. Freshwater or brackish
 - Lvs <6mm wide **F**
 - Lvs >6mm wide **G**
 - Lvs compound (1-pinnate etc) or lobed
 - Lvs with translucent bladders (for trapping micro-fauna) **H**
 - Lvs without translucent bladders **I**
- Lvs floating on surface (rarely emergent). If ligule present [a grass] go to Group **Q**
 - ◆ Lvs <10mm diam **J**
 - ◆ Lvs >10mm diam
 - Lf veins pinnate (or obscure); lvs usu broadly oval to orbicular **K**
 - Lf veins parallel
 - Lvs elliptic-lanc, with veins usu translucent **L**
 - Lvs linear, long, with veins always opaque **M**
- Lvs (or stem only) emergent or terrestrial
 - ◆ Lvs absent (stems only) **N**
 - ◆ Lvs whorled **O**
 - ◆ Lvs not whorled
 - Lvs Iris-like (equitant) **P**
 - Lvs not Iris-like
 - Lf veins parallel, usu >3 veins visible (stomata often in parallel rows)
 - Lf sheath with free ligule or ring of hairs (grasses and sedges) **Q**
 - Lf sheath with auricles (rushes) **R**
 - Lf sheath without auricles or ligule/ ring of hairs **S**
 - Lf veins pinnate (or palmate) (or 0-3 parallel veins), occ obscurely so or palmately veined. Usu dicots
 - Lvs simple
 - Lvs entire **T**
 - Lvs spiny **U**
 - Lvs toothed or lobed
 - Lvs opp **V**
 - Lvs alt (or single) **W**
 - Lvs 3-foliolate **X**
 - Lvs 1-pinnate **Y**
 - Lvs 2-4-pinnate **Z**

Group A – Lvs in basal rosettes (fragments may be washed up on shoreline)

- Lvs fully opaque with cellular aerenchyma structure [Image 1]
 - ◆ Lvs aloe-like, sharply toothed; rosettes usu not rooted *Water-soldier* **Stratiotes aloides**
 - ◆ Lvs not aloe-like or sharply toothed; rosettes usu rooted
 - Lvs with 4 large hollows and cross-veins, \pm cylindrical
 - Lvs stiff, brittle (audible snap), hollows \pm equal *Quillwort* **Isoetes lacustris**
 - Lvs flaccid, straight, hollows unequal *Spring Quillwort* **Isoetes echinospora**
 - Lvs with 2 large hollows (double-barrelled), cross-veins absent, sparse latex present. Upland lakes
..... *Water Lobelia* **Lobelia dortmanna**
 - Lvs solid or with indistinct hollows
 - Lvs with cross-veins (HTL¹, occ indistinct); auricles present, 1mm, overlapping; plant bulbous at base
Lvs with 2-4 indistinct hollows in TS², 0.5-1.5mm diam; plant often reddish
..... *Bulbous Rush* **Juncus bulbosus**
 - Lvs without cross-veins
Lvs with few long hairs at extreme base, 2-3mm diam, spongy aerenchyma, sheathing at base
..... *Shoreweed* **Litorella uniflora**
 - Lvs hairless, tapering to acute point, 1-1.5mm diam at base, solid, not sheathing. Mtn lakes
..... *Awlwort* **Subularia aquatica**
- Lvs translucent without aerenchyma block (cell) structure, cross-veins present, brittle and crunchy, like spider-plant
 - ◆ Lvs with latex, no odour. Fls white; petals 3 *Water-plantain* **Alisma plantago-aquatica**
 - ◆ Lvs without latex
 - Lvs with strong odour; stolons usu absent. Fls white; petals 3
..... *Lesser Water-plantain* **Baldellia ranunculoides**
 - Lvs without odour
 - Plant with stolons, looking like spider-plant. Fls white; petals 3. Sch8
..... *Floating Water-plantain* **Luronium natans**
 - Plant without stolons. W Scot, Ire *Pipewort* **Eriocaulon aquaticum**

¹ HTL – Hold to the light

² TS – Transverse section or cross-section

Group B – lvs whorled or pseudowhorled (spiralling around stem)

- Lvs simple
 - ◆ Lvs pseudowhorled, in spiral of 3-4 around stem
 - Lvs minutely toothed, strongly recurved *Curly Waterweed* **Lagarosiphon major**
 - ◆ Lvs 3(4) whorled
 - Lvs entire except nr apex
 - Lvs minutely toothed nr acute apex, strongly recurved, often twisted, 1-1.5mm wide at base
..... *Nuttall's Waterweed* **Elodea nuttallii**
 - Lvs minutely toothed nr ± obtuse apex, never strongly recurved, 2.5-3mm wide at base
..... *Canadian Waterweed* **Elodea canadensis**
 - Lvs toothed all along length
 - Lvs minutely toothed, 1mm wide; stem smooth. Lakes, N from Lancs. Sch8 *Slender Naiad* **Najas flexilis**
 - Lvs deeply spiny toothed, 1.5mm wide; stems spiny. Norfolk Broads. Sch8.....
..... *Holly-leaved Naiad* **Najas marina**
 - ◆ Lvs usu 4-6 whorled
 - Lvs in whorls of 4, crowded, entire to minutely toothed, 5mm wide. R alien
..... *Large-flowered Waterweed* **Egeria densa**
 - Lvs in whorls of 4-6, not crowded, finely toothed, 2(5) mm wide, brown fringed scales present above nr base.
VR, Scot, Ire *Esthwaite Waterweed* **Hydrilla verticillata**
 - ◆ Lvs in whorls of 6-11. Stem round
 - Stem stout, opaque, often above water, smooth..... *Mare's-tail* **Hippuris vulgaris**
 - Stem v slender, translucent, always submerged (stoneworts)
 - Stems spiny or bumpy. Plant often smelling of garlic or fish..... **Chara spp**
 - Stems smooth. Branchlets unbranched but with tuft of minute branchlets at tips **Nitella spp**
 - Stems smooth. Branchlets unbranched without tuft of minute branchlets at tips **Nitellopsis obtusa**
 - Stems smooth. Branchlets weakly branched with acute point at tips **Tolypella spp**
 - Stems smooth. Branchlets weakly branched with several acute points at tips. Brackish water
..... *Foxtail Stonewort* **Lamprothamnium papulosum**
- Lvs lobed or compound
 - ◆ Lvs pseudowhorled (appearing 2-6-whorled); lfts (segments) linear (flat), entire, no apical bristles, 1-pinnate, 9-12 per side; petioles without sheathing base *Water-violet* **Hottonia palustris**
 - ◆ Lvs usu 4-6 whorled; lfts (segments) thread-like, entire, no apical bristles
 - Lvs usu 4-whorled
 - Lvs with 6-12 lobes per side, flaccid out of water; stems 0.8-1.2mm diam.....
..... *Alternate Water-milfoil* **Myriophyllum alterniflorum**
 - Lvs with 16-18 lobes per side, ± rigid out of water, often encrusted in marl. Usu eutrophic or base-rich water; stems 1.5-3mm diam..... *Spiked Water-milfoil* **Myriophyllum spicatum**
 - Lvs usu 5-whorled, 12-16 lobes per side. Usu base-rich water
..... *Whorled Water-milfoil* **Myriophyllum verticillatum**
 - Lvs (4)5-6 whorled, 4-15 lobes per side, pale blue-green, covered in sessile glands. Usu eutrophic water
..... *Parrot's-feather* **Myriophyllum aquaticum**
 - ◆ Lvs >7 whorled, forked (at least once), minutely toothed at least nr apex, with apical bristles
 - Lvs 1(2)-forked, rigid, terminal lvs occ much thicker *Rigid Hornwort* **Ceratophyllum demersum**
 - Lvs 3-forked, flaccid. Usu brackish water or as ornamental..... *Soft Hornwort* **Ceratophyllum submersum**

Group C - Lvs opp

- Lvs forked, petiolate, repeatedly forked, ciliate or stiffly hairy on margins
..... *Carolina Water-shield Cabomba caroliniana*
- Lvs simple
 - ◆ Lf margin entire
 - Lvs translucent
 - Lvs 0.3-2mm wide, tapering to v fine minutely mucronate apex, wide central darker green band
..... *Horned Pondweed Zannichellia palustris*
 - Lvs usu opaque
 - Lvs succulent, apex acute; petioles joined around stem; stem round with dark ring below node (often slightly constricted) *New Zealand Pigmyweed Crassula helmsii*
 - Lvs not succulent, apex usu notched;
Stipules absent; petioles joined around stem *Water-starwort Callitriche spp*
Stipules present, translucent, toothed; petioles not joined around stem. Lvs to 8mm, occ 4-whorled, spatulate, obtuse, not connate at base, usu opaque, midrib usu obscure. Stems rooting at nodes (many roots per node), round, 6-10 hollows (cartwheel-like)
Fl stalk > fl bud length *Six-stamened Waterwort Elatine hexandra*
Fl stalk < fl bud length (to absent) *Eight-stamened Waterwort Elatine hydropiper*
 - ◆ Lf margin toothed
 - Lvs flaccid, minutely toothed, translucent midrib and 1(3) lateral veins per side, sessile, clasping
..... *Opposite-leaved Pondweed Groelandia densa*
 - Lvs rigid, spiny, brittle, all veins obscure. Norfolk Broads. Sch8 *Holly-leaved Naiad Najas marina*

Group D – Lvs with pinnate veins, large and crumpled like lettuce leaf

- Lvs large, fan-shaped, crumpled, shiny, like semi-translucent lettuce
..... (submerged lvs) *Yellow Water-lily Nuphar lutea*

Group E – Lvs with spiral fibres on tearing, 3-5 equal parallel veins, in sea water

- Lvs dark green, translucent, cross-veins present (often subopp), spiral fibres on tearing. All spp with short lvs in winter
 - ◆ Lvs usu 5-10mm wide, usu 5-veins; lf sheaths closed *Eelgrass Zostera marina*
 - ◆ Lvs usu 1.5-2.5mm wide, 3 main veins; lf sheaths closed *Narrow-leaved Eelgrass Zostera angustifolia*
 - ◆ Lvs usu <1mm wide, 3 main veins; lf sheaths open *Dwarf Eelgrass Zostera noltei*

Group F – Lvs <6mm wide

- Lvs opaque, channelled
 - ◆ Lvs 0.5-1mm wide, thread-like, ± flat, channelled above, veins 3-4, with 2 hollows or solid, sheathing base; stem 1mm diam, ± round.....*Floating Club-rush Eleogiton fluitans*
- Lvs translucent, not channelled, dark green, thin
 - ◆ Stem round or v slightly compressed
 - Lf minutely toothed nr apex, 2 air hollows in TS³ (not easily seen but try x20). Brackish or saline water *Tasselweed Ruppia spp*
 - Lf always entire
 - Lf attached to a loose sheath with a free ligule (3-15mm), usu with 2 air hollows (occ hard to see), 0.5-1mm wide, thread-like apex always entire. Brackish or freshwater.
 - Lf sheath open and overlapping *Fennel Pondweed Potamogeton pectinatus*
 - Lf sheath closed when young. N. Britain *Slender-leaved Pondweed Potamogeton filiformis*
 - Lf attached directly to stem (no loose sheath), 0.5-1mm wide, tread-like
 - Lvs stiff, not adhering together when removed from water, <0.5mm wide
..... *Hair-like Pondweed Potamogeton trichoides*
 - Lvs limp, adhering together when removed from water, 1-2mm wide
 - Stipules open and overlapping; nodal glands usu present
..... *Small Pondweed Potamogeton berchtoldii*
 - Stipules closed when young; nodal glands usu absent ... *Lesser Pondweed Potamogeton pusillus*
 - ◆ Stem flattened
 - Lvs ≤2mm wide
 - Lf v acute, 1 lateral vein either side of midrib *Sharp-leaved Pondweed Potamogeton acutifolius*
 - Lf obtuse, 2 lateral veins either side of midrib *Grass-wrack Pondweed Potamogeton compressus*
 - Lvs 2-4mm wide
 - Lf apex acute, often mucronate, 2 lateral veins per side *Flat-stalked Pondweed Potamogeton friesii*
 - Lf apex obtuse, not or scarcely mucronate, usu 1 lateral vein per side
..... *Blunt-leaved Pondweed Potamogeton obtusifolius*

³ TS – Transverse section or cross-section

Group G – Lvs >6mm wide

- Lvs all sessile, v thin, translucent, crispy when dry
 - ◆ Lvs strongly clasping with auricles, margin minutely toothed ... *Perfoliate Pondweed* **Potamogeton perfoliatus**
 - ◆ Lvs weakly clasping or rounded at base, margin minutely toothed and crisped
.....*Curled Pondweed* **Potamogeton crispus**
 - ◆ Lvs rounded (at base), margin entire, not strongly wavy *Long-stalked Pondweed* **Potamogeton praelongus**
 - ◆ Lvs tapered at base
 - Lf margin entire. Lvs culnate at base, narrowly oblog-elliptic ± obtuse, flat, shiny-green or reddish, with 6-10 veins per side.....*Red Pondweed* **Potamogeton alpinus**
 - Lf margin minutely toothed (at least when young); hybrid of *P. lucens* x *perfoliatus*
.....*Potamogeton* x *salicifolius*
- Lvs mostly sessile but uppermost shortly stalked
 - ◆ Lvs tapered at base, margin minutely toothed.....*Various-leaved Pondweed* **Potamogeton gramineus**
- Lvs all shortly stalked (usu 5-15mm)
 - ◆ Lvs with minutely toothed margin, and tapering at base*Shining Pondweed* **Potamogeton lucens**
 - ◆ Lvs with entire margin
 - Lvs usu with protruding midrib; hybrid of *P. lucens* x *natans*.....**Potamogeton** x *fluitans*
 - Lvs without protruding midrib. Calc fens*Fen Pondweed* **Potamogeton coloratus**

John asks...

Would a photo help with this identification feature?

Group H – Lvs with translucent bladders (for trapping micro-fauna). NB Lvs irregularly divided with tiny apical bristles

- Finely dissected lvs and bladders on same stem; lvs pinnately divided
 - ◆ Lf segments with >2 bristles on teeth. Base-rich water *Greater Bladderwort* **Utricularia vulgaris**
 - ◆ Lf segments with 1-2 bristles on teeth. Acid water*Bladderwort* **Utricularia australis**
- Finely dissected lvs and bladders mostly on separate stems; lvs palmately divided
 - ◆ Lf segments minutely toothed, with 1-2 bristles on teeth**Utricularia intermedia**
 - ◆ Lf segments entire, with 1 terminal bristle *Lesser Bladderwort* **Utricularia minor**

Group I – Lvs without translucent bladders

- Lvs absent (thalli only; i.e. plant not differentiated into root, stem and leaf). Usu floating just below surface
 - ◆ Thallus simple, <1mm diam, nearly spherical, veins absent; plant floating on or nr surface.....
.....*Rootless Duckweed Wolffia arrhiza*
 - ◆ Thallus forked into branches..... (a liverwort) *Floating Crystalwort Riccia fluitans*
 - ◆ Thallus joined into chains, appearing 3-lobed, <15mm diam, translucent, elliptic-lanc, obscurely 3-veined, tapered at base to 7mm stalk, ± acute, usu minutely serrate at apex*Ivy-leaved Duckweed Lemna trisulca*
- Lvs 1-pinnate, flat; petioles without sheathing base. Fls pinkish-white; petals 5..... *Water-violet Hottonia palustris*
- Lvs 2-3(6) pinnate; petioles with sheathing base
 - ◆ Lfts with 1-3(4) apical bristles, usu divided into 3's, thread-like
 - Lfts round, bristle-like, acute; petiole with sheathing base; plant without smell [suborbicular floating lvs may be present]. Fls white; petals 5..... *Water-crowfoot Ranunculus aquatilis agg*
Petiole usu >0.5cm. Lvs ± orb in outline, with segments not in 1-plane
Lvs (3)4-6x divided, the segments usu divergent, rigid or flaccid, with 2 minute bristles at apices
Petals usu >10mm, with pear-shaped nectary pit..... *Pond Water-crowfoot Ranunculus peltatus*
Petals <10mm, with circular nectary pit *Common Water-crowfoot Ranunculus aquatilis*
Lvs 4-6x divided, with short (1-2cm) rigid divergent segments, occ sparsely bristly, with 2-4 bristles at apices. Petals 3-6mm. Ann or per *Thread-leaved Water-crowfoot Ranunculus trichophyllus*
Petiole <0.5cm. Lvs ± orb in outline, with rigid segments in 1-plane (like wheel-spokes)
Lvs 3-4x divided, each segment with 2-3 bristles at apex. Per. All yr (lvs flaccid in winter). Permanent water, often eutrophic *Fan-leaved Water-crowfoot Ranunculus circinatus*
 - ◆ Lfts without apical bristle(s), usu divided into 2's (forked)
 - Lfts round or flat, occ bristle-like, but without apical bristles, usu divided into 2's; petiole with sheathing base ± swollen; plant with sweet celery smell when crushed. Fls white *Lesser Marshwort Apium inundatum*
 - Lfts flat, obtuse, broad (not bristle-like), deeply lobed; petiole sheathing at base; plant with sweet celery smell when crushed. Fast-flowing calc rivers. Fls white.....*River Water-dropwort Oenanthe fluviatilis*

Group J – Lvs <10mm diam

- Roots absent
 - ◆ Lvs (thalli) <1mm diam, nearly spherical, veins absent; plant floating on or nr surface
..... *Rootless Duckweed Wolffia arrhiza*
- Roots single
 - ◆ Lvs (thalli) to 7mm diam, not translucent
 - Lvs overlapping in 2-ranks
 - Lvs with few short unicellular hairs both sides; plant often growing in large masses, blue-green turning red late summer..... *Water Fern Azolla filiculoides*
 - Lvs not overlapping in 2-ranks
 - Lvs swollen below, usu 4-5 veins originating from same point at base, convex above with obscure reticulations, 3-5mm diam *Fat Duckweed Lemna gibba*
 - Lvs thin and ± flat
 - Lvs 1-veined, ridged (often obscure), usu 1.5-2mm, pale dull green, usu elliptic (symmetric), obtuse and occ with v minute point (x20) *Least Duckweed Lemna minuta*
 - Lvs usu 3-veined (occ obscure), additional veins not usu originating from same point at base, usu 3-4mm long, opaque, dark glossy green, usu obovate (asymmetric), apex rounded without a point
..... *Common Duckweed Lemna minor*
- Roots several (7-12)
 - ◆ Lvs usu with 5-12 veins, 4-7mm diam, often purplish below *Greater Duckweed Spirodela polyrhiza*

John asks...

Would a photo help with this identification feature?

Group K – Lf veins palmate (or obscure); lvs usu broadly oval to orbicular

- Floating lvs palmately lobed. Finely dissected submerged lvs often present. Floating lvs with stomata above only
 - ◆ Submerged lvs alt, with 1-3(4) apical bristles. Fls white; petals 5..... *Water-crowfoot* **Ranunculus aquatilis agg**
 - Petiole usu >0.5cm. Lvs ± orb in outline, with segments not in 1-plane
 - Submerged lvs (3)4-6x divided, the segments usu divergent, rigid or flaccid, with 2 minute bristles at apices
Petals usu >10mm, with pear-shaped nectary pit..... *Pond Water-crowfoot* **Ranunculus peltatus**
 - Submerged lvs 4-6x divided, with short (1-2cm) rigid divergent segments, occ sparsely bristly, with 2-4 bristles at apices. Petals 3-6mm. Ann or per.. *Thread-leaved Water-crowfoot* **Ranunculus trichophyllus**
 - Petiole <0.5cm. Petals <5mm. Fr stalks strongly recurved
 - Floating lvs 0.5-1.5cm, usu reniform and 3-lobed (cut >2/3 way to base); middle lobe narrower than lateral lobes, cuneate at base, entire or crenate. Intermediate lvs usu absent. Ann. Muddy habs. VR.....
..... *Three lobed Crowfoot* **Ranunculus tripartitus**
- Floating lvs palmately lobed. Finely dissected submerged lvs never present. Floating lvs with stomata both sides
 - ◆ Lvs floating or emergent, to 7cm diam, orb, 3-7-lobed, shiny dark green above, paler below, minute stomata both sides. Petiole round, with aerenchyma and 4-5 obscure vb's. Stems often floating, without stomata, snapping audibly, each node with 20-40 roots. All yr. Invasive aquatic
..... *Floating Pennywort* **Hydrocotyle ranunculoides**
- Floating lvs entire
 - ◆ Lvs with pinnate veins herringbone-like and forked, margin flat
 - Lvs 12-40 x 8-30cm, with 23-28 lateral veins, midrib occ hairy below. Fls yellow
..... *Yellow Water-lily* **Nuphar lutea**
 - Lvs 4-14 x 3.5-13cm, with lateral veins ± obscure or indistinct. Fls yellow. R, Highland lakes
..... *Least Water-lily* **Nuphar pumila**
 - ◆ Lvs with palmate veins mostly radiating from where the blade joins the petiole
 - Lvs with tubercles below (purplish when old), margin slightly scalloped. Fls yellow
..... *Fringed Water-lily* **Nymphoides peltata**
 - Lvs without tubercles, margin flat. Fls white *White Water-lily* **Nymphaea alba**
 - ◆ Lvs with veins ± parallel and converging at apex
 - Latex present in petiole; lvs usu arrow-shaped. Fls white; petals 3..... *Arrowhead* **Sagittaria sagittifolia**
 - Lvs absent in petiole
 - Lvs with bowed parallel-veins only, with a pore-like terminal hydathode visible below; petiole sheathing at base. Fls white; petals 3. Frs star-like. Sch8 *Starfruit* **Damasonium alisma**
 - Lvs with bowed parallel-veins with 'pinnate-laddering' at ± 90° to midrib
 - Stipules present. Fls white; petals 3..... *Frogbit* **Hydrocharis morsus-ranae**
 - Stipules absent. Mostly Montgomery-Manchester region. Fls white; petals 3. Sch8
..... *Floating Water-plantain* **Luronium natans**
 - ◆ Lvs with veins forming closed loops (anastomosing), rough with adpressed hairs above. Fls pink.....
..... (floating lvs) *Amphibious Bistort* **Persicaria amphibia**

John asks...

Would a photo help with this identification feature?

Group L - Lvs elliptic-lanc, with veins usu translucent

- Petioles jointed below blade (discoloured flexible joint); lf veins usu translucent.....
..... *Broad-leaved Pondweed* **Potamogeton natans**
- Petiole not jointed, without discoloured junction
 - ◆ Lf veins \pm opaque. Bogs (usu acid) *Bog Pondweed* **Potamogeton polygonifolius**
 - ◆ Lf veins v translucent. Calc eutrophic rivers *Loddon Pondweed* **Potamogeton nodosus**

Group M – Lvs linear, long, with veins always opaque

- Lvs with latex.....*Arrowhead* **Sagittaria sagittifolia**
- Lvs without latex
 - ◆ Lvs rounded at apex
 - Lvs long (>20cm), not curved towards apex..... *Branched Bur-reed* **Sparganium erectum**
 - Lvs short (<20cm), curved towards apex..... *Least Bur-reed* **Sparganium natans**
 - ◆ Lvs acute at apex *Floating Water-plantain* **Luronium natans**

Group N – Lvs absent (stems only)

- Stem smooth, round, pith spongy
 - ◆ Stems >6mm diam
 - Stems green. Freshwater..... *Common Club-rush* **Schoenoplectus lacustris**
 - Stems glaucous-grey. Brackish or freshwater..... *Grey Club-rush* **Schoenoplectus tabernaemontani**
 - ◆ Stems <6mm diam
 - Basal sheaths absent
 - Lvs arising in 1-3's from rhizomes, 2-8cm, 1-1.5mm diam, wavy, circinate when young (in croziers), green, soon purplish, hay-scented, no stomata, 10-12 hollows around central stele. Rhizomes with pill-like swellings (3mm diam, globose, green) when fertile. Jun-Oct..... (a fern) *Pillwort* **Pilularia globulifera**
 - Basal sheaths open, reddish to dark-red brown to black (darkening towards base), tough.....
..... *Soft Rush* **Juncus effusus**
 - Basal sheaths closed, translucent, v thin
 - Stems 1.5-4mm diam *Common Spike-rush* **Eleocharis palustris**
 - Stems ≤ 1.2 mm diam
 - Stems mostly >10cm
 - Usu saline habs. Rhizomatous, with stems 10-60cm. Basal sheaths reddish
..... *Slender Spike-rush* **Eleocharis uniglumis**
 - Bogs. Densely tufted (v short rhizomes), with stems 10-35cm. Basal sheaths orange-brown (occ purple)..... *Many-stalked Spike-rush* **Eleocharis multicaulis**
 - Stems mostly >10cm
 - Basal sheaths orange-brown to reddish. Stems 0.5-1mm diam, to 15cm, obtusely 5-6-angled, 6 large hollows or pith-filled *Few-flowered Spike-rush* **Eleocharis quinqueflora**
 - Basal sheaths colourless (occ brownish at apex) with purple veins. Stems 0.2-0.9mm diam, to 8cm (underwater stems rarely to 50cm), round to 3-4-angled, with 3 hollows (occ pith-filled). Often submerged *Needle Spike-rush* **Eleocharis acicularis**
- Stem ridged or grooved, at least to touch
 - ◆ Stems with continuous pith, 3-5mm diam, green; sheaths red-brown to olive.....
..... *Compact Rush* **Juncus conglomeratus**
 - ◆ Stems with interrupted pith, <2.5mm diam, glaucous; basal sheaths blackish-purple..... *Hard Rush* **Juncus inflexus**
 - ◆ Stems without pith, with at least a small central hollow
 - Stems without whorls of branches (or branches solitary/ opp, v short or ill-developed), hollow $>4/5$ diam, (2)4-7(10)mm diam, 10-20(30) v shallow grooves. Usu aquatic *Water Horsetail* **Equisetum fluviatile**
 - Stems with whorls of branches, hollow $\leq 1/2$ diam, 1-3mm diam, 4-10 rounded ridges.....
..... *Marsh Horsetail* **Equisetum palustre**

John says...

Other *Juncus* species should be added here. What do you think?

John asks...

Would a photo help with this identification feature?

Group O – Lvs whorled

- Dwarf woody shrub to 0.5m. Lvs hairy (often glandular), 4-whorled, 2-4 x 0.5-1mm, linear, strongly revolute. Fls purple-pink, bell shaped. Damp hths *Cross-leaved Heath* **Erica tetralix**
- Herb
 - ◆ Lvs elliptic, broad, mostly 3-4-whorled
 - Stems stout, ridged, hairless, hollow, with ± swollen nodes. Stipular glands long, red. Lvs 3-whorled, without orange dots, (12)24-75 teeth per side, hairless. Petiole to 3.5cm, hollow. Stem to 200cm, stout, reddish, ridged, with reddish roots present at lower nodes. Fls pink..... *Indian Balsam* **Impatiens glandulifera**
 - Stems slender, round to square (often depending on whether 2-4 lvs at nodes), usu hairy, solid to loosely pith-filled, occ hollow nr base. Stipular glands absent. Lvs often 3-4-whorled, with orange dots both sides, entire, usu hairy. Fls yellow *Yellow Loosestrife* **Lysimachia vulgaris**
 - ◆ Lvs linear, narrow. Stipoid glands absent
 - Stems square (or 4-furrowed), with whorls of 4-12 lvs
 - Lf margins with antrorse or patent prickles (or absent) at least nr midpoint. Stems often smooth h
Stems rough (rarely smooth), usu ± erect. Fls white in bud *Common Marsh-bedstraw* **Galium palustre**
Stems smooth or occ slightly rough on angles, ± prostrate. Fls pale pink in bud.....
..... *Slender Marsh-bedstraw* **Galium constrictum**
 - Lf margins with retrorse prickles in proximal 1/3 (occ antrorse in distal 1/2). Stems rough, with prickles
Lvs obtuse to ± acute (occ with v short mucro when young), 4-5(6)-whorled, weak prickles often
straight/antrorse or v sparse. Stems ± rough (rarely smooth). Plant usu rough to touch.....
..... *Common Marsh-bedstraw* **Galium palustre**
Lvs with long (≥0.5mm) apiculus, 6-7(8)-whorled, 20-30 strong curved prickles per side. Stems v rough.
Plant v rough to touch..... *Fen Bedstraw* **Galium uliginosum**
 - ◆ Lvs (actually branches) cylindrical
 - Stems with whorls of branches solitary, v short or ill-developed, hollow >4/5 diam, (2)4-7(10)mm diam, 10-20(30) v shallow grooves. Usu aquatic *Water Horsetail* **Equisetum fluviatile**
 - Stems with distinct whorls of branches, hollow <1/2 diam, 1-3mm diam, 4-10 rounded ridges
..... *Marsh Horsetail* **Equisetum palustre**

Group P – Lvs Iris-like (equitant)

- Lvs glaucous, 15-50mm wide, odourless, margins not wrinkled. Fls yellow; petals 3.....
..... *Yellow Iris* **Iris pseudoacorus**
- Lvs green, 10-25mm wide, with sweet citrus smell, margins wrinkled. Fls green, spike-like
..... *Sweet-flag* **Acorus calamus**
- Lvs green, 2-5mm wide, odourless, margins not wrinkled. Fls yellow; petals 6. Bogs.....
..... *Bog Asphodel* **Narthecium ossifragum**

Group Q - Lf sheath with free ligule or ring of hairs (grasses and sedges)

- Ligule a ring of hairs
 - ◆ Lvs (3)10-45mm wide. Ligule 1mm, no whiskers on collar *Common Reed Phragmites australis*
 - ◆ Lvs (2)4-10mm wide. Ligule <0.5mm, long whiskers on collar *Purple Moor-grass Molinia caerulea*
- Ligule a free membrane (grasses)
 - ◆ Lvs with obvious cross-veins (**NB** Glyceria cannot normally be separated vegetatively!!)
 - Lvs usu 10-14mm wide, emergent, not floating; ligule shorter than broad, cuspidate..... *Reed Sweet-grass Glyceria maxima*
 - Lvs usu <10mm wide, floating or occ emergent; ligules longer than broad, never cuspidate
 - Ligule often rounded BAD CHAR *Plicate Sweet-grass Glyceria notata*
 - Ligule long acute
 - Lvs glaucous grey-green *Small Sweet-grass Glyceria declinata*
 - Lvs green, not glaucous grey-green
 - Spikelets disarticulating *Floating Sweet-grass Glyceria fluitans*
 - Spikelets not disarticulating *Hybrid Sweet-grass Glyceria x pedicellata*
 - ◆ Lvs without obvious cross-veins
 - Lf sheaths closed; lvs folded in bud; ligule glabrous
 - Ligule 1-3mm; lvs not ribbed *Whorl-grass Catabrosa aquatica*
 - Ligule 3-10mm; lvs deeply ribbed above *Tufted Hair-grass Deschampsia cespitosa*
 - Lf sheaths open; lvs channelled in bud *Velvet Bent Agrostis canina*
 - Lf sheaths open; lvs rolled in bud; ligule minutely hairy
 - Lvs broad, >5mm wide
 - Lvs slightly narrowed to base, smooth both sides. Ligule 6-10mm, obtuse, ± toothed to jagged, occ sparsely ciliolate, minutely hairy to hairless *Reed Canary-grass Phalaris arundinacea*
 - Lvs strongly narrowed to base, ± smooth above, rough below. Ligule 2-7(12)mm, obtuse to acute, torn, stiff, ciliolate, often brown, hairless to obscurely hairy *Wood Small-reed Calamagrostis epigejos*
 - Lvs narrow, <5mm wide
 - Lf sheaths with a bluish-white bloom *Marsh Foxtail Alopecurus geniculatus*
 - Lf sheaths green *Creeping Bent Agrostis stolonifera*
- Ligule an adnate membrane (mostly sedges)
 - ◆ Lvs ≤1mm wide
 - Lvs <10(20)cm. Not tussock-forming
 - Lvs with 2 stomatal bands below. Stems round, with small hollow *Dioecious Sedge Carex dioica*
 - Lvs with 3-5 stomatal bands below. Stems ribbed, solid *Deer-grass Trichophorum spp*
 - Lvs <10(20)cm. Tussock-forming
 - Lvs triangular (upper side flat), rounded at apex with 0.5-1mm blackish tip. Basal sheaths pinkish. Stems round below, trigonous above. Bogs, wet hths *Hare's tail Cottongrass Eriophorum vaginatum*
 - Lvs channelled above, acute. Basal sheaths shiny blackish. Stems oval to round. Usu base-rich bogs and fens *Black Bog-rush Schoenus nigricans*

- ◆ Lvs >1mm wide
 - Lvs with abundant stomata above (often dull above), usu <5mm wide
 - Ligule v obtuse. Lvs with trigonous tip 3-10cm. Basal sheaths reddish.....*Bottle Sedge* **Carex rostrata**
 - Ligule ± acute. Lvs with trigonous tip <5cm or absent. Basal sheaths rarely reddish
 - Lvs dark blue-green (to glaucous) above, dull or shiny dark green below, firm, stomata usu absent below. Basal sheaths dark brown, occ reddish *Common Sedge* **Carex nigra**
 - Lvs dull pale green both sides ('apple green'), soft, stomata abundant below. Basal sheaths pale brown to whitish *White Sedge* **Carex canescens**
 - Lvs without stomata above
 - Lvs with hollows in cross-section
 - Tussock-forming. Lvs U-shaped, acute, no trigonous tip, occ puckered above. Basal sheaths blackish-brown. Fens *Greater Tussock-sedge* **Carex paniculata**
 - Rhizomatous. Lvs flat or U-shaped, obtuse (x10), 5-25cm triquetrous tip (often blackish-red). Basal sheaths pink (occ red-streaked). Bogs, fens *Common Cottongrass* **Eriophorum angustifolium**
 - Lvs without hollows in cross-section
 - Lvs dull or glaucous below, >40cm, mostly >5mm wide
 - Ligule obtuse, often much wider than long. Basal sheaths reddish.....
..... *Greater Pond Sedge* **Carex riparia**
 - Ligule acute, always longer than wide
 - Basal sheaths reddish
 - Lvs (12)14-21mm wide, shiny dark yellow-green above. Ligule 15-60mm.....
..... *Pendulous Sedge* **Carex pendula**
 - Lvs 6-12(15)mm wide, usu folding on drying, ± dull bluish-green above. Ligule (5)7-12(20)mm
..... *Lesser Pond Sedge* **Carex acutiformis**
 - Basal sheaths not reddish (usu whitish)
 - Tufted, forming small tussocks. Basal sheaths weakly ladder-fibrillose. Often wet calc habs
..... *Tufted-sedge* **Carex elata**
 - Rhizomatous. Basal sheaths not ladder-fibrillose *Slender Tufted-sedge* **Carex acuta**
 - Lvs dull or glaucous below, usu <40cm, mostly <5mm wide
 - Lvs with trigonous tip. Ligule entire (but retuse), not fimbriate
 - Ligule 0-1mm. Lvs ± shiny yellow- to mid-green above. Sheaths convex at apex, often split. Basal sheaths usu pale brown *Tawny Sedge* **Carex hostiana**
 - Ligule 1-2mm. Lvs v glaucous above (often less so below), thick. Sheaths concave (or obliquely so) to ± straight at apex. Basal sheaths whitish-brown
..... *Carnation Sedge* **Carex panicea**
 - Lvs without trigonous tip, dull grey-green to glaucous above, whitish-glaucous below. Ligule retuse, minutely fimbriate (often obscure). Basal sheaths (reddish-) brown to reddish
..... *Glaucous Sedge* **Carex flacca**

Lvs shiny green below

Ligule >4mm and/or lvs >8mm wide

Lvs <6mm wide. False-stems present

Basal sheaths brown. Sheaths herbaceous exc for concave hyaline apex. Lvs usu with fine trigonous tip 1.5-6cm, shiny dark (yellow-) green both sides, cross-veins often obvious and puckered. Ligule 2-8mm, often brown-scarious *Brown Sedge Carex disticha*

Basal sheaths reddish. Sheaths membranous. Lvs without trigonous tip, light to dark green above, cross-veins weak or absent. Ligule 3-8mm, white *Spiked Sedge Carex spicata*

Lvs >5mm wide. Basal sheaths whitish-brown

Lvs (4)5-10mm wide, with 1-5cm trigonous tip, smooth but puckered above, shiny mid- to yellow-green both sides, cross-veins distinct. Ligule 4-10mm

..... *False Fox-sedge Carex otrubae*

Lvs (6)8-15mm wide, without trigonous tip, rough or minutely puckered above, shiny yellow-green both sides, cross-veins distinct, occ with hollows. Ligule 10-15mm

..... *Cyperus Sedge Carex pseudocyperus*

Ligule <4mm. Lvs <8mm wide, with trigonous tip

Sheaths convex at apex

Lvs (U)V-shaped, without cross-veins (or obscure if present), translucent midrib but other veins obscure. Ligule 0.5-1mm. Basal sheaths lfless but with short fragile aristate tip, tough, like those of *Juncus*. Bogs *White Beak-sedge Rhynchospora alba*

Sheaths concave at apex

False-stem present

Lvs 4-20cm x (1)2-3mm, V-shaped, trigonous tip to 5cm, (1)3-5 weakly translucent veins each side of v translucent midrib, cross-veins usu weak. Ligule (0.5)1-3mm. Usu bogs

..... *Star Sedge Carex echinata*

False-stem absent

Uppermost lvs with a ligule. Basal lvs usu >5cm long, 2-5mm wide, acute. Ligule 0.5-3(4)mm, ± truncate to obtuse (occ ± acute) *Yellow-sedges Carex viridula agg*

Uppermost lvs without a ligule. Basal lvs >5cm long, (3)4-6(8)mm wide, obtuse. Ligule 0.5mm, rounded, those on stem lvs to 2mm and unequal, turning brown. Base-rich bogs and calc flushes *Broad-leaved Cottongrass Eriophorum latifolium*

Uppermost lvs without a ligule. Basal lvs to 5cm long, 1-5mm wide, usu shorter than stems, soon withering, with cross-veins. Stems to 5(10)cm. Sheaths purple-veined at base. Ann. VR. Sch8 *Brown Galingale Cyperus fuscus*

Group R - Lf sheath with auricles (rushes)

- Lvs with distinct cross-partitions detectable by touch (run fingers firmly along lf)
 - ◆ Lvs with longitudinal partitions. Basal sheaths greenish, pale orange-brown at extreme base
 - Lvs 2-3mm diam, bright green, smooth. Stems to 120cm, occ purplish above, not compressible, solid to hollow.....*Blunt-flowered Rush Juncus subnodulosus*
 - ◆ Lvs without longitudinal partitions. Basal sheaths often reddish
 - Lvs with 1(2) septa per 5cm. Lvs 3mm diam, smooth, slightly curved, oval, slightly flattened, shiny green, hollow. Auricles 0.5-2mm. Stems to 100cm, ± erect..... *Sharp-flowered Rush Juncus acutiflorus*
 - Lvs with 5-10 septa per 5cm/ Lvs 1.5-2.5mm diam, slightly ribbed, curved, ± oval to strongly flattened, dull green, pith-filled or hollow. Auricles 1.5mm. Stems to 50cm, ± prostrate at base.....
.....*Jointed Rush Juncus articulatus*
- Lvs with distinct cross-partitions detectable by touch (run fingers firmly along lf)
 - ◆ Lvs solid
 - Lvs aromatic (soap-scented), to 15cm x 0.8-1.5(2.5)mm, semi-cylindrical, channelled above nr base, obtuse, veins not visible*Marsh Arrowgrass Triglochin palustre*
 - Lvs odourless, 5-30cm x 1-1.5(3)mm, flat or channelled, with minutely bifid or trifid apex (occ obscure or broken), dull dark green, weakly ridged below, midrib translucent below only
..... *Round-fruited Rush Juncus compressus*
 - ◆ Lvs with 2-several indistinct hollows
 - Lvs 2-10cm x 0.7-1.2mm, usu all basal, ± cylindrical but channelled above, indistinct cross-partitions. Per with bulb-like swellings at base, often rooting at nodes *Bulbous Rush Juncus bulbosus*

Group S – Lf sheath without auricles or ligule/ ring of hairs

■ Latex present (often sparse)

- ◆ Lvs usu arrow-shaped; petiole with latex present throughout cross-section
 - Petiole \pm sharply triangular, large air spaces in TS⁴, green at blade join. Fls white; petals 3
..... *Arrowhead* **Sagittaria sagittifolia**
 - Petiole irregular shape, small air spaces in TS, purplish at blade join, purple-black spotting nr base. Fls white; petals 3 *Duck-potato* **Sagittaria latifolia**
- ◆ Lvs not arrow-shaped; petiole with latex confined to margin in cross-section
 - Lf blade distinct from petiole
 - Petioles \pm round or channelled, occ large equal aerenchyma in cross-section. Fls white; petals 3
..... *Water-plantain* **Alisma plantago-aquatica**
 - Petiole irregular with large aerenchyma in cross-section. Fls white; petals 3.....
..... *Narrow-leaved Water-plantain* **Alisma lanceolatum**
 - Lf blade not or hardly discernible from petiole; later lvs with a short (1.5-4cm) linear-lanc or narrowly oblong blade, widest nr base. Fls white; petals 3. VR, Worcs. Sch8
..... *Ribbon-leaved Water-plantain* **Alisma gramineum**

■ Latex absent

- ◆ Lvs flat along entire length
 - Lvs heart-shaped
 - Lvs >10cm, >5cm wide, >20 main veins, odourless. Fls blue; petals 6
..... *Pickereelweed* **Pontedaria cordata**
 - Lvs 10-30cm, elliptic-ovate, cuspidate (almost with a drip-tip), many parallel veins converging at apex, rolled when young, stomata both sides. Petiole 10-30cm, spongy, long auriculate sheathing base, weakly channelled, soon hollow, many vb's⁵. Fls white, *Arum*-like *Bog Arum* **Calla palustris**
 - Lvs several, in a rosette, 1.5-4cm, ovate, obtuse to \pm acute, few parallel veins converging at apex (occ obscure), hyaline margins minutely crenulate. Petiole to 7cm, without sheathing base, channelled, with 1 vb. Fls white; petals 5..... *Grass-of-Parnassus* **Parnassia palustris**
 - Lvs lanc-shaped
 - Lvs <2cm wide, 3 main veins, strong coriander odour. Fls white; petals 3.....
..... *Lesser Water-plantain* **Baldellia ranunculoides**
 - Lvs <3cm wide, 4-8 veins each side of midrib, vanilla odour, occ faintly spotted. Fls pink-purple, occ white *Marsh-orchids* **Dactylorhiza spp**
 - Lvs linear
 - Lvs >10cm
 - Lvs 10-20mm wide, V-shaped, acute, whip-like trigonous apex, margins v sharply serrate, glaucous. Fens *Great Fen-sedge* **Cladium mariscus**
 - Lvs (4)6-10mm wide, M-shaped, acute non-trigonous apex (often dead), margins scabrid, green.....
..... *Galingale* **Cyperus longus**

⁴ TS – Transverse section or cross-section

⁵ Vb (plural vb's) - Vascular bundles

- Lvs <10cm

Plant reddish. Basal sheaths occ reddish, with greenish-brown veins (plant may be reddish). Lvs 0.6-1.5mm wide, acute with minute (<0.1mm) mucro, mid-green, slightly channelled, occ inrolled, veins and cross-veins obscure. Stems round..... *Toad Rush* **Juncus bufonius**

Plant green. Basal sheaths with purplish or dark red veins. Sheaths closed. Lvs 1-2, nr base of stems, to 2cm x 0.5-0.7mm, ± obtuse, ± flat but channelled above, usu shorter than stems, cross-veins indistinct, hollow(s) obscure in TS⁶. Stems to 15cm, oval, ± solid, stomata all around. Tufted ann or per, usu remaining green. Apr-Oct (all yr)

Spikelets 1(3). Terminal bract usu ≤ infl. Nutlet smooth *Slender Club-rush* **Isolepis cernua**

Spikelets (1)2-4. Terminal bract >> infl. Nutlet ridged *Bristle Club-rush* **Isolepis setacea**

Plant green. Basal sheaths absent. Stems creeping, forking into branches of unequal length. Lvs scale-like, 5 x 1mm, lanc, acute, overlapping, 1-veined (usu not visible), spirally arranged
..... *Marsh Clubmoss* **Lycopodiella inundata**

◆ Lvs triangular nr base only

◦ Lvs 10-25mm wide. Infl branched..... *Branched Bur-reed* **Sparganium erectum**

◦ Lvs 3-12mm wide. Infl unbranched. Usu occurs in deeper water than *S. emersum*
..... *Unbranched Bur-reed* **Sparganium emersum**

◆ Lvs triangular above midpoint (becoming flat nr tip), 4-15mm wide, spiral fibres present when torn. Fls pink

..... *Flowering-rush* **Butomus umbellatus**

◆ Lvs semi-cylindrical, flat and rounded at tip

◦ Lvs 12-18mm wide. Infl without gap *Bulrush* **Typha latifolia**

◦ Lvs 4-6mm wide. Infl with 2-12cm gap between male and female portions
..... *Lesser Bulrush* **Typha angustifolia**

⁶ TS – Transverse section or cross-section

Group T – Lvs entire (*Marsh Clubmoss Lycopodiella inundata* may key out here in error)

■ Lvs alt

- ◆ Lvs sticky with glandular hairs. Bogs or peaty habs. Plant insectivorous
 - Lvs with long ± flattened petiole, viscid with red patent tentacle-like glandular hairs
 - Petiole hairy. Lvs broader than long. Damp to wet bogs..... *Round-leaved Sundew* ***Drosera rotundifolia***
 - Petiole hairless or with sparse sessile glands. Lvs not broader than long. Damp peaty hths and moors
..... *Oblong-leaved Sundew* ***Drosera intermedia***
 - Lvs ± sessile, viscid with 0.3mm (and sessile) glandular hairs above, margin involute
 - Lvs to 2 x 1cm, pale olive-green with reddish veins, translucent, v thin. Acidic bogs, mostly W Br
..... *Pale Butterwort* ***Pinguicula lusitanica***
 - Lvs 2.5-5(9) x 1-2.5cm, yellow-green (occ pinkish below), opaque, slightly fleshy. Basic bogs. Mostly N & W Br
..... *Common Butterwort* ***Pinguicula vulgaris***
- ◆ Lvs sticky (to woolly clothing!) with minute hooked hairs below. Plant not insectivorous
 - Basal lvs 15-30cm, narrowly triangular, acute, rounded-cuneate at base, weakly adpressed hairs above to 1.5mm. Petiole strongly and broadly decurrent, 5(9) vb's⁷. Stems to 150cm, 2(4)-winged (due to broad long-decurrent petioles). Fls white *Common Comfrey* ***Symphytum officinale***
- ◆ Lvs cottony or woolly at least below. Plant not insectivorous
 - Lvs >5mm wide, with (±) prominent hydathodes along margin, with short or indistinct petiole, clasping or decurrent, rugose, margins often revolute, pinnate-veined, odorous. Fls yellow, daisy-like.....
..... *Common Fleabane* ***Pulicaria dysenterica***
 - Lvs <5mm wide, without hydathodes along margins, sessile, often undulate, 1(3)-veined, odourless. Winter-wet habs, often avoiding calc soils. Fls white, daisy-like..... *Marsh Cudweed* ***Gnaphalium uliginosum***
- ◆ Lvs not sticky or cottony. Plant not insectivorous
 - Lvs revolute when young, usu with mildly acidic (or hot!) taste. Ochreae (fused stipules) present, whitish or turning brown and papery
 - Lvs mostly basal (smaller lvs on stem if present) but often dead after flowering, long-petiolate
Lvs gradually tapered to petiole (long-cuneate), papillate or not on veins below. Tufted per. Lvs 30-100 x 10-25cm. Aquatic. Lvs mostly basal lanc to ovate, acute or acuminate, held erect, often ± undulate, dull grey-green, occ with papillae on veins below. Petiole purplish at base, with many scattered purple vb's and sparse spiral fibres. Stems 80-200cm *Water Dock* ***Rumex hydrolapathum***
 - Lvs usu on stem only (basal leaves, if present, much smaller), not long petiolate
Lvs roughly adpressed-hairy above, ± cordate at base, often with black blotch above, with 3 crease lines each side of midrib. Fls pink *Amphibious Bistort* ***Persicaria amphibia***
Lvs white-woolly or sparsely so below (occ hairless), cuneate at base, often with black blotch above. Fls usu white, occ pink..... *Pale Persicaria* ***Persicaria lapathifolia***
Lvs sparsely hairy below, or with adpressed hairs on midrib below, cuneate at base, often black-blotched above. Fls pink..... *Redshank* ***Persicaria maculosa***
Lvs hairless exc for adpressed hairs on midrib below and long cilia to 0.4mm, cuneate at base. Ochreae with strongly adpressed (or fused) hairs, with cilia 1-4mm. Fls pink.....
..... *Tasteless Water-pepper* ***Persicaria mitis***
Lvs hairless below (even midrib) exc for short cilia <0.1mm, cuneate at base, with hot peppery taste. Ochreae hairless, with cilia 1-2.5mm. Fls pink..... *Water-pepper* ***Persicaria hydropiper***

⁷ Vb (plural vb's) - Vascular bundles

- Lvs not revolute when young, usu tasteless. Ochreae or stipules always absent
 - Lvs with single swollen white hydathode below at apex; petioles not sheathing at base
Stems with spreading hairs below but adpressed hairs above. Fls blue, 8-10mm across.....
..... *Water Forget-me-not* **Myosotis scorpioides**
 - Stems with spreading hairs all along (exc v top). Fls blue, 6-8mm across. Acidic habs
..... *Creeping Forget-me-not* **Myosotis secunda**
 - Stem with adpressed hairs all along. Fls blue, 4mm across.....
..... *Tufted Forget-me-not* **Myosotis laxa** ssp **caespitosa**
 - Lvs with hydathodes sunken along margins (best viewed end-on); petioles sheathing at base
Basal lf blade >7cm, ovate to oblong. Fls yellow *Greater Spearwort* **Ranunculus lingua**
 - Basal lf blade 2-6cm, ovate to lanc. Fls yellow *Lesser Spearwort* **Ranunculus flammula**
 - Basal lf blade 1-2cm, ovate to orb. Fls yellow. VR. Sch8
..... *Adder's-tongue Spearwort* **Ranunculus ophioglossifolius**
 - Lvs without hydathode even at tip; petioles not sheathing at base
Basal lvs 1-8cm, obovate to spatulate (like a daisy leaf), obtuse, minutely pitted both sides. Fls white
..... *Brookweed* **Samolus valerandi**

■ Lvs opp (or 3-whorled)

◆ Stipules present, tiny

- Lvs ± translucent shiny dirty red-green, with sunken pale hydathodes along margins below, with 2^o veins fading nr margins. Stems usu emergent, rooting at lower nodes. Fls green. VR, mostly New Forest
..... *Hampshire-purslane* **Ludwigia palustris**
- Lvs not translucent, 4-8(10)cm, lanc to ovate, (±) acute, ± cordate-clasping at base, slightly undulate, shortly septate-hairy (to ± hairless), ciliate. Stipules occ present, 0.2mm, soon falling. Fls purple.....
..... *Purple-loosestrife* **Lythrum salicaria**

John says...
Lysimachia vulgaris may key out here incorrectly.

◆ Stipules absent

◦ Stems square

- Stems creeping along ground, with 4 hollows in TS⁸. Lvs 1-2cm, obovate-spatulate, obtuse, often ± fleshy *Water purslane* **Lythrum portula**
- Stems not creeping
Stems with an elastic stele (pull stem until it snaps revealing an elastic stretchy central column)
Lvs not ciliate at base, usu glaucous, 15-50mm, linear-lanc, margins recurved. Stems erect. Fls white. R, calc marshes *Marsh Stitchwort* **Stellaria palustris**
- Lvs ciliate at base, slightly glaucous, (6)10-20mm, elliptic or oblanc to ovate, margins not recurved. Stems mat-forming. Fls white. Often neutral to acid habs *Bog Stitchwort* **Stellaria uliginosa**
- Stems without an elastic stele, narrowly winged
Lvs with black glands on margins both sides, with translucent dots all over surface, odorous, 2-4cm, oblong-ovate, obtuse, ± clasping at base, ± glaucous below. Fls yellow
..... *Square-stalked St John's-wort* **Hypericum tetrapterum**

⁸ TS – Transverse section or cross-section

- Stems round or grooved or absent
 - Stems creeping
 - Stipules silvery, entire
 - Stems red. Lvs 2-6mm, ± orb. Sch8..... *Coral-necklace Illecebrum verticillatum*
 - Stipules absent
 - Lvs with orange glands both sides, 1-3cm, ovate, odourless. Stems occ 4-winged (± square). Fls yellow *Creeping-Jenny Lysimachia nummularia*
 - Lvs red-black glands along margins below, to 0.5cm, ± orb, sweet disinfectant odour. Fls pink *Bog Pimpernel Anagallis tenella*
 - Lvs without glands, 5-15mm, linear-subulate, odourless. Fls usu green (petals absent), occ white *Procumbent Pearlwort Sagina procumbens*
 - Lvs without glands, 3-10mm, ± orb, purplish below, entire to obscurely 3-toothed. Stems with 2 opp lines of minute hairs. Fls whitish. Usu uplands *New Zealand Willowherb Epilobium brunnescens*
 - Stems erect
 - Plant with at least some hairs (may even be confined to petiole margins)
 - Lvs with orange dots both sides
 - Lvs often 3-4-whorled, 5-12cm, lanc to ovate, shortly petiolate to sessile, hairy. Stems hairy, round to square (often depending on whether 2-4 lvs at nodes). Fls yellow *Yellow Loosestrife Lysimachia vulgaris*
 - Lvs with translucent dots
 - Stems round, densely hairy (underwater shoots hairless). Lvs 1-3cm, ± orb to broadly ovate, ± clasping at base, odourless, densely hairy, 5(7)-pli-veined. Fl buds with liquorice-scented reddish glandular hairs. Fls yellow *Marsh St John's-wort Hypericum elodes*
 - Lvs without orange or translucent dots
 - Stems solid, to 60cm, 1-3mm diam, round (occ with 2 raised lines), often with short antrorse incurved hairs, often glandular-hairy above. Lvs entire or obscurely denticulate, 2-7cm, lanc to linear-lanc, ± sessile, ± hairless both sides (occ with incurved hairs), with incurved cilia. Fls usu pale pink *Marsh Willowherb Epilobium palustre*
 - Stems with elastic stele, decumbent to erect, to 1m, brittle, usu with glandular septate hairs above. Lvs 2-5cm, ovate, ± cordate at base, usu undulate, sparsely hairy to hairless, weakly translucent 2^o veins forming submarginal vein, opaquely net-veined. Petiole short to ± absent. Fls white *Water Chickweed Myosoton aquaticum*
 - Stems hollow, to 75cm, retrorsely hairy, slightly rough, angled. Lvs mostly basal, 4-10cm, oblanc, narrowed to long indistinct petiole, hairless, long-ciliate at base. Fls pink *Ragged-Robin Lychnis flos-cuculi*
 - Plant totally hairless
 - Stems ≥5mm diam
 - Stems to 40cm, green or reddish, usu emergent, rooting at lower nodes. Lvs 1.5-3(5)cm, ovate to broadly elliptic, ± translucent, shiny dirty red-green, sunken pale hydathodes along margins below. Stipules (when present) minute, gland-like. VR, New Forest *Hampshire-purslane Ludwigia palustris*

Stems <5mm diam. Ann

Lvs (0)1-2 prs, 2-6mm. Stem 2-8cm, unbranched, slender. Fls yellow; petals 4. VR, damp hths, W Br, Ire *Yellow Centaury* **Cicendia filiformis**

Lvs >2 prs, 10-25 x 5mm, oblong-ovate, the upper linear-lanc, ± sessile, pale green. Stem 10-25cm, erect, unbranched, hairless, 2 obscure raised lines that are obscurely crenulate. Fls pink; petals 5. Sch8 *Grass-poly* **Lythrum hyssopifolium**

Lvs >2prs, 4-15mm, narrowly spatulate to obovate, obtuse, with white hydathode at apex (often obscure), narrowed to indistinct petiole (rarely long), ± fleshy, with clearly visible cells (x20), often reddish. Petiole broader at base. Stems usu <5cm, often reddish. Fls white; petals 5 *Blinks* **Montia fontana**

Group U – Lvs spiny

- Basal lvs with long distinct petiole, often white-cottony below, 6-15(25) x 1-3cm, elliptic-lanc, dull and hairy above, with weak spines along margins with elongated swollen purple bases, entire (exc for spines) or toothed. Fls purple. Fens, wet hths, mostly S Br, Ire *Meadow Thistle* **Cirsium dissectum**
- Basal lvs sessile (or petiole short and spiny), cottony hairs usu sparse or absent, 10-50cm, oblanc to broadly so, pinnately lobed. Fls purple to white *Marsh Thistle* **Cirsium palustre**

Group V – Lvs toothed or lobed, opp

- Lvs mint-scented, with sessile glands when v young; stem square
 - ◆ Stems prostrate, rooting at most nodes. Lvs 1-2cm, elliptic-ovate, cuneate to ± rounded at base, often strongly channelled, yellow-green to purple, often with translucent glands, sickly-scented, 1-4(6) teeth per side. Sch8 *Pennyroyal* **Mentha pulegium**
 - ◆ Stems usu erect, occ rooting at lower nodes. Lvs 2-6cm, ovate, rounded at base, often purplish, with sessile yellow glands when young, (5)7-15 teeth per side *Water Mint* **Mentha aquatica**
- Lvs not mint-scented
 - ◆ Stem square, hollow
 - Basal lvs present
 - Basal lvs deeply cordate to rounded at base, 6-12cm, elliptic to ovate, with or without translucent dots, stomata both sides. Petiole often with 2 lobes nr lf *Water Figwort* **Scrophularia auriculata**
 - Basal lvs ± cordate to cuneate at base, 6-15cm, elliptic to ovate (to lanc), with translucent dots, stomata below only. Petiole without basal lobes *Green Figwort* **Scrophularia umbrosa**
 - Basal lvs absent (lvs usu all on stems), not rugose, not cordate at base. Stems hollow
 - Lvs usu deeply lobed near base, otherwise deeply toothed, with some hairs at least on veins below, to 10cm, ovate-lanc or elliptic, sessile. Stems to 60(90)cm, hairy *Gypsywort* **Lycopus europaeus**
 - Lvs toothed only
 - Lvs 16-35 teeth per side, 5-10cm, oblong-lanc or linear-lanc, acute, rounded to ± cordate at base, weakly fetid. Stems to 100cm, angles with long retrorse hairs on rough swollen bases, faces often minutely hairy *Marsh Woundwort* **Stachys palustris**
 - Lvs 6-23 teeth per side, 2-5(7)cm, decreasing in size up stem, oblong-lanc, ± obtuse, cordate at base, often with recurved margins at maturity, occ purplish below (esp lower lvs), shortly hairy both sides (esp below). Stems to 50cm, lfless below, branched above, sparse retrorse crisped hairs on angles only *Skullcap* **Scutellaria galericulata**
 - Lvs (0)1-4 teeth per side at base, not net-veined. 1-3 x 1cm, lanc, sparsely adpressed-hairy both sides when young, ciliate. Stems to 20cm, with sparse crisped hairs..... *Lesser Skullcap* **Scutellaria minor**
 - ◆ Stem square, solid (see below) *Square-stalked Willowherb* **Epilobium tetragonum**
 - ◆ Stem (±) round
 - Stem fetid when broken. Hairs unicellular or absent. Scrambling or sprawling woody-based per. At least some lvs developing 2(4) lobes or lfts at base (otherwise entire), 4-8(11)cm, ovate, acute-acuminate, rounded to cordate at base, hairless or shortly hairy..... *Bittersweet* **Solanum dulcamara**
 - Stem aromatic when broken. Hairs septate. Stems round (to weakly angled) or absent, solid
 - Stem with purple-black resin canals. Lvs 5-15cm, lanc-elliptic, (0)3(5)-partite, deeply serrate, opaquely net-veined (Kranz venation), 2^o veins ± raised both sides. Stems to 80cm, hairless to ± hairy, long-ciliate interpetiolar ridge, spiral fibres around submarginal vb's⁹
 - No lvs lobed (toothed only) *Nodding Bur-marigold* **Bidens cernua**
 - All lvs (0)3-lobed *Trifid Bur-marigold* **Bidens tripartita**
 - Some lvs often 5-lobed. VR alien *Beggarticks* **Bidens frondosa** var **anomala**

⁹ Vb (plural vb's) - Vascular bundles

- Stem without purple-black resin canals

Lvs with colourless sessile glands below, and minutely translucent gland-dotted (HTL¹⁰), 5-10cm, 3(5)-lobed, net-veined. Stems to 150cm, purplish, hairy *Hemp-agrimony* **Eupatorium cannabinum**

° Stem not aromatic when broken

- Stems hollow or becoming hollow

Stems translucent, not rooting at nodes, hairless, 40-70cm, brownish, with strongly swollen nodes. Lvs dull dark (bluish-) green, (6)8-12 teeth per side (lower teeth glandular-ciliate), 3-9cm, ovate-to elliptic.

Ann. Fls orange. Usu by rivers, S Br *Orange Balsam* **Impatiens capensis**

Stems opaque, rooting at lowest nodes

Lvs 5-7-ply-veined. Stems hairless below, occ glandular-hairy above *Monkey-flower* **Mimulus** spp

Lvs pinnate-veined, 5-12 x 1-2cm, ± connate at base, slightly pitted above, 2^o veins obscure. Stems occ hairy below, hairless above, 10-40cm tall, green or purplish, weakly 3-ridged, aerenchyma around doughnut-like stele. Ann (per). (The following two spp form a vigorous sterile hybrid to 90cm tall, *V. x lackschewitzii*, which may replace the parents)

Fls usu blue. Lvs petiolate below (lowest prs(s) only), narrowly ovate to lanc, many deep teeth or obscurely crenate with 6-15 teeth per side. Upper lvs lanc, acute, ± clasping at base

..... *Blue Water-speedwell* **Veronica anagallis-aquatica**

Fls usu pink. Lvs sessile, linear to linear-lanc, few shallow teeth. Upper lvs similar to lower lvs

..... *Pink Water-speedwell* **Veronica catenata**

- Stems solid

Petiole long (to 7cm), distinct

Basal lvs to 4cm, ovate-elliptic to ± broadly triangular, obtuse, scabrid-ciliate, entire or obscurely sinuate-toothed with white sunken hydathodes along margins above. Petiole channelled, 3(5) vb's¹¹ around small hollow *Marsh Valerian* **Valeriana dioica**

Petiole short or indistinct. Extra-floral nectaries absent

Stems creeping or rooting at lower nodes

Lvs ± translucent, shiny dirty red-green, with sunken pale hydathodes along margins below, with 2^o veins fading nr margins. Stems usu emergent, rooting at lower nodes. Extra-floral nectaries usu present at petiole base, tiny, gland-like, black. VR, mostly New Forest

..... *Hampshire-purslane* **Ludwigia palustris**

Lvs 2.5-6 x 3cm, ovate to oblong, obtuse, rounded at base, minutely pitted both sides, with 9-20 shallow teeth per side..... *Brooklime* **Veronica beccabunga**

Lvs 2-4 x 0.4-0.6cm, linear-lanc to lanc, acute, ± clasping at sessile base, not pitted, with (0)2-6 v shallow teeth per side esp nr tip..... *Marsh Speedwell* **Veronica scutellata**

Lvs 0.5-2cm, orb, obtuse, truncate or broadly cuneate at base, with submarginal hydathodes (in centre of weakly retuse lobes) and narrow cartilaginous margins, glandular-hairy to hairless, glandular-ciliate, with 0-7 shallow obtuse teeth per side

..... *Opposite-leaved Golden-saxifrage* **Chrysosplenium oppositifolium**

¹⁰ HTL – Hold to the light

¹¹ Vb (plural vb's) - Vascular bundles

Stems erect

Lvs all opp, 1-veined

Lvs all sessile, \pm clasping, 1.5-8cm, linear-lanc, margins cartilaginous, obscurely gland-dotted, teeth almost bristle-tipped. Stem 1, 20-60cm, angled, occ sparsely cottony above

..... *Sneezewort* **Achillea ptarmica**

Lvs often alt above, pinnate-veined, the translucent midrib often fading before apex and the 2^o veins often fading nr margins

Stem lvs densely (\pm) patent-hairy (basal lvs hairless)

Stem lvs \pm clasping, sessile, shortly decurrent down stem, with hairs to 1.3mm both sides, no translucent dots. Stems to 150cm, densely hairy with 1-2mm hairs, sticky-hairy above

..... *Great Willowherb* **Epilobium hirsutum**

Stem lvs not clasping or decurrent, sessile or shortly petiolate (to 2mm), softly greyish-hairy (occ reddish) with spreading 0.2-0.5mm hairs both sides, with translucent dots.

Stems to 75cm, densely hairy with 0.7-1.5mm hairs

..... *Hoary Willowherb* **Epilobium parviflorum**

All lvs (\pm) hairless (may be ciliate) or with hairs confined to veins. **NB** hybrids occur!

Stem lvs with 0-1mm petiole, clearly decurrent into 2 stem ridges. Lvs 2-8 x 0.3-1cm, narrowly lanc or linear-lanc, often held erect, hairless exc for minute cilia, stomata both sides. Stem to 75cm, 4-angled to round, antrorsely incurved-hairy esp on angles, without glandular hairs even on infl/frs

..... *Square-stalked Willowherb* **Epilobium tetragonum**

Stem lvs with 0-1mm petiole, decurrent into raised lines on stem. Lvs usu 3-8 x (0.8)1.2-2.8cm, alt above, ovate-lanc, occ hairy on veins, stomata above (occ absent). Stem 20-80cm, \pm round below but with 2 or 4 weakly raised lines (at least above), hairless below, often hairy on veins above. Infl with some glandular hairs

..... *Short-fruited Willowherb* **Epilobium obscurum**

Stem lvs with 1.5-4mm petiole, often connate but not decurrent, hairless exc for minute cilia, 2-8(10) x 0.7-3cm, ovate-lanc to lanc, held (erecto-) patent, usu with translucent dots, stomata below only. Stems 10-75cm, round or 4 raised lines, hairy all round (often hairless below) or 2(4) lines of short hairs, glandular-hairy at least above; branches held upright

..... *American Willowherb* **Epilobium ciliatum**

Group W – Lvs toothed or lobed, alt (or single). Lvs peltate (attached at centre of leaf)

■ Lvs (±) orb

◆ Lvs cottony at least below

- Lvs palmately lobed, all basal, usu emerging in prs (occ 3's) from rhizome, 10-100cm diam, denticulate, net-veined, cordate at base. Petiole long, solid or hollow, strong soap-like odour when cut, turning orange-brown, >30 scattered vb's¹² and spiral fibres *Butterbur* **Petasites hybridus**

◆ Lvs not cottony

◦ Stipules obvious

- Lvs involute when young, strongly cordate at base, 3-7cm diam, orb-reniform, hairy to hairless *Marsh Violet* **Viola palustris**

◦ Stipules absent (obscure and fused into ochrea in *Hydrocotyle*)

- Petiole with 2 hollows

Basal lvs 1-4cm diam, ± entire to angled or weakly lobed, crenate, hairless, cordate at base, occ ± fleshy, shiny dark green above often with darker or pale markings. Petiole with translucent channel

..... *Lesser Celandine* **Ranunculus ficaria**

Basal lvs to 1.5(2) x 1.2cm, (±) hairless, entire or with 3-5 indistinct dark hydathodes along margins, occ 3-5-lobed. VR. Sch8 *Adder's-tongue Spearwort* **Ranunculus ophioglossifolius**

- Petiole with 1 hollow or solid

Lvs usu lobed <½ way, hairless below

Lvs >4cm diam..... *Marsh-Marigold* **Caltha palustris**

Lvs 0.8-5cm diam, shallowly palmately 5(7)-lobed with crenate lobes. Petiole usu with scattered hairs in distal ¼. Stipules fused into ochrea (look carefully at stem, often buried)

..... *Marsh Pennywort* **Hydrocotyle vulgaris**

Lvs 1.5-4cm diam, reniform to ± orb, usu 3-5-lobed (lobes almost touching), with lobes narrowest at base (broadest above, with narrow acute sinus). Petiole often 3-6x lf length. Muddy habs or shallow water *Round-leaved Crowfoot* **Ranunculus omiophyllus**

Lvs 0.4-1.8cm diam, ivy-shaped to reniform, usu 3-5-lobed, with lobes widest at base (with broad ± obtuse sinus). Petiole to 3x lf length. Muddy habs..... *Ivy-leaved Crowfoot* **Ranunculus hederaceus**

Lvs usu lobed >½ way, usu hairy below

Lvs with glandular hairs

Basal lvs 1.5-3.5cm, orb, cordate at base, yellow-green, with sparse stout minutely glandular hairs, crenate with 9-11 shallow slightly lobes, veins obscure. Petiole to 9cm, hairy

..... *Alternate-leaved Golden-saxifrage* **Chrysosplenium alternifolium**

¹² Vb (plural vb's) - Vascular bundles

Lvs without glandular hairs

Lvs 4-12 x 7cm, reniform or pentagonal, cordate to truncate at base, shiny mid-green both sides, hairless, 3(5)-lobed (lowest lvs often ± entire), with ± obscure opaque veins often slightly raised both sides; lobes often 2-3-lobed again. Stem lvs often 3-foliolate. Petiole round but channelled, solid *Celery-leaved Buttercup* **Ranunculus sceleratus**

Lvs 0.5-2cm, usu reniform, 3-5-lobed (occ <1/2 way); middle lobe usu narrower than lateral lobes, cuneate at base, entire or crenate. Intermediate lvs often present. Petals <6mm. Fr stalks erect, ± straight. New Forest. *R omiophyllus x tripartitus*
..... *New Forest Water-crowfoot* **Ranunculus x novae-forestae**

Lvs 0.5-1.5cm, usu reniform and 3-lobed; middle lobe narrower than lateral lobes, cuneate at base, entire or crenate. Intermediate lvs usu absent. Petals <5mm. Fr stalks strongly recurved. Muddy habs, VR *Three-lobed Crowfoot* **Ranunculus tripartitus**

■ Lvs not orb

◆ Lvs pinnately-lobed

◦ Plant with weak radish or cucumber/dill scent when crushed. Basal lvs 2-4(8)cm, margins strongly recurved, limp, often reddish. Stem 1 to 60cm (*Pedicularis sylvatica* to 20cm), erect, many branched. Top hooded petal with 4 teeth nr tip (2 in *Pedicularis sylvatica*). Fls purple. Bogs, fens *Marsh Lousewort* **Pedicularis palustris**

◦ Plant weakly fetid when crushed. Stem lvs with tiny lobes at base, partly or weakly clasping stem (at least the middle and upper lvs), revolute when young. Basal lvs usu dead at fl, often lyrate-pinnatifid with a large ovate-oblong terminal lobe and 1(3) prs small lobes at base, to 15cm, often purplish below. Stem(s) to 80cm, purplish nr base. Fls yellow, daisy-like *Marsh Ragwort* **Senecio aquaticus**

◦ Plant with cress odour when crushed

- Stem hollow, to 120cm, often rooting at nodes. Basal (and lower lvs) to 20cm. Stem lvs often auriculate but not ciliate *Great Yellow-cress* **Rorippa amphibia**

- Stem usu hollow, 10-30cm, not rooting at nodes. Basal (and lower) lvs (4)6-15cm, with larger rounded terminal lobe and 1-6 prs of smaller lobes (occ with intercalary lfts). Stem lvs with ciliate auricles
..... *Marsh Yellow-cress* **Rorippa palustris**

- Stem solid, 5-15cm, not rooting at nodes. Basal lvs to 10cm, with 2-4 prs of lobes. Stem lvs with ciliate auricles. Frs usu arranged on 1 side of stem *Northern Yellow-cress* **Rorippa islandica**

◆ Lvs not pinnately-lobed

◦ Shrub

- Lvs with sessile glands, sweetly aromatic. Lvs 2-6 x 1-1.6cm, oblanc, yellow sessile glands both sides, toothed nr tip. Bogs *Bog-myrtle* **Myrica gale**

John asks...
Should this be moved to a new woody plants section?

◦ Herb

- Latex present

Petiole hollow. Lvs basal and/or on stems, narrowed to a short winged petiole, (\pm) hairless, sinuate-toothed or with runcinate teeth. Stem lvs sessile, clasping with auricles. Petiole pinkish-red at base.

Stems hollow. Fls yellow, daisy-like. N Br *Marsh Hawk's-beard* **Crepis paludosa**

- Latex absent

Lvs cottony or woolly at least below. Lvs rugose, margins often revolute, odorous. Fls yellow, daisy-like

Lvs to 5(8) x 1-2.5cm, oblong-lanc to oblanc, cordate at base, clasping or decurrent, no glands

below, obscurely toothed. Rhizomatous *Common Fleabane* **Pulicaria dysenterica**

Lvs to 4 x 0.5-1.5cm, elliptic-lanc, not cordate at base, weakly clasping, yellow sessile glands below.

Ann. VR, New Forest. Sch8 *Small Fleabane* **Pulicaria vulgaris**

Lvs not cottony or woolly, with hydathodes sunken along margins (best viewed end-on); petiole sheathing at base. Fls yellow, buttercup-like

Lf blade >7cm. Fl size *Greater Spearwort* **Ranunculus lingua**

Lf blade <7cm. Fl size *Lesser Spearwort* **Ranunculus flammula**

Group X – Lvs 3-foliate

- Stipules absent
 - ◆ Stem not aromatic when broken
 - Lfts 3-10 x 6cm, obovate to ovate-elliptic, hairless, often net-veined, with 4-8 white hydathodes along each side above. Petiole 7-20cm, spongy, often with prominent rounded auricles at long sheathing base, round with 6 vb's¹³ in circle. Fls white *Bogbean* **Menyanthes trifoliata**
 - ◆ Stem aromatic when broken. Hairs septate. Stems round (to weakly angled) or absent, solid
 - Stem with purple-black resin canals. Lvs 5-15cm, lanc-elliptic, (0)3(5)-partite, deeply serrate, opaquely net-veined (Kranz venation), 2^o veins ± raised both sides. Stems to 80cm, hairless to ± hairy, long-ciliate interpetiolar ridge, spiral fibres around submarginal vb's. Fls yellow, daisy-like
 - No lvs lobed (toothed only) *Nodding Bur-marigold* **Bidens cernua**
 - All lvs (0)3-lobed *Trifid Bur-marigold* **Bidens tripartite**
 - Some lvs often 5-lobed. VR alien *Beggarticks* **Bidens frondosa var anomala**
 - Stem without purple-black resin canals
 - Lvs with colourless sessile glands below, and minutely translucent gland-dotted (HTL¹⁴), 5-10cm, 3(5)-lobed,
net-veined. Stems to 150cm, purplish, hairy. Fls pink *Hemp-agrimony* **Eupatorium cannabinum**
- Stipules obvious or lf-like
 - ◆ Lfts entire
 - Stipules' lft-like (true stipules minute, <0.2mm, brown, soon falling). Lfts thin, 2^o veins visible and translucent, 12-20(25) x 7-10(15)mm, obovate, ± glaucous below, ± densely hairy to ± hairless, ciliate. Stems hollow. Fls yellow *Greater Bird's-foot-trefoil* **Lotus pedunculatus**
 - ◆ Lfts toothed
 - Lfts 3-5 (if 5, the lowest pr are actually stipules), 0.5-2cm, with (2)3-4(5) teeth per side, the teeth usu tipped with reddish hydathodes, (±) net-veined. Stems (if present) ± prostrate, not rooting at nodes. Petals 4, yellow *Tormentil* **Potentilla erecta**

¹³ Vb (plural vb's) - Vascular bundles

¹⁴ HTL – Hold to the light

Group Y – Lvs 1-pinnate

- Petiole solid. Intercalary lflets present (i.e. lflets alternating large and small). Basal lvs with terminal lft much larger than lateral lflets and often 3-lobed, net-veined
 - ◆ Plant with antiseptic odour. Terminal lft 1.5-8cm, ovate, usu 3-lobed. Stem 4-angled
 - Lflets 2-5 larger prs, 1.5-8cm, larger along rachis, ovate, dark green and hairless above (often rough with sparse minute adpressed hairs), hairy or shortly white-woolly below, 2-serrate; smaller intercalary lflets 1-4mm, 2-5 prs between main lflets. Stipules present *Meadowsweet* **Filipendula ulmaria**
 - ◆ Plant odourless. Terminal lft 3-12cm, ± orb, ± net-veined. Stem round
 - Stipules usu absent from basal lvs (but present on ± 3-foliolate stem lvs). Basal lvs with (1)3-6 prs unequal lflets; terminal lft cordate-rounded to cuneate at base, wider than long, densely softly shortly ± patent-hairy both sides..... *Water Avens* **Geum rivale**
 - Petiole solid. Intercalary lflets absent
 - ◆ Stems hollow; petiole with 3 vb's¹⁵, channelled *Water-cress* **Rorippa nasturtium-aquaticum agg/microphylla**
 - ◆ Stems solid or absent
 - Lflets pale or purple-glaucous below, dull dark blue-green above, 1-2(3) prs, usu opp, often appearing palmately arranged, 3-6 x 1-2cm, oblong, silky-hairy to ± hairless below, with 7-9 red teeth per side; terminal lft often 3-lobed. Petiole long. Stipules on stem lvs only, papery, turning brown *Marsh Cinquefoil* **Potentilla palustris**
 - Lflets not pale or purple-glaucous below. Plant cress-scented when crushed
 - Stems rooting at least at lowest nodes. Petiole with (1)3-7 vb's. Terminal lft often larger than laterals. Stem round, solid, usu shortly (0.5mm) hairy below, with hot water-cress taste
 - Lflets 2-3 prs, 1-2.5cm, the lowest pr often remote from others, ovate or orb to lanc, often ± cordate at base, short-stalked, yellow-green, hairless. Wet shady habs *Large Bitter cress* **Cardamine amara**
 - Stems not rooting at lowest nodes. Plant with mild cress taste
 - Perennial, with a short underground stolon or rooting at lf tips
 - Lflets 1-7 prs; terminal lft 0.5-1.5(2)cm, ovate to orb or reniform, often cordate at base, stalked, all occ sparsely hairy to hairless, often 3-toothed, mild cress taste; lateral lflets usu smaller *Cuckooflower* **Cardamine pratensis**
 - Annual to perennial, easily uprooted, with fibrous roots. Basal lvs 5-15 in false rosette, to 7(10)cm, 3-6 prs of ovate to reniform lateral lflets and a larger terminal lft; terminal lft to 2.5cm, sparsely hairy above, ciliate, ± lobed or angled. Stems (1)2mm wide, short hairs to 0.5mm esp below, ridged. Fls with (4)6 stamens *Wavy Bitter-cress* **Cardamine flexuosa**
- Petiole hollow, with sheathing base
 - ◆ Petiole with ring-mark (or remote pr of reduced lflets nr base), without latex. Usual water
 - Lflets 5-10 prs, often held in horizontal plane. Petiole with celery smell; lflets without cartilaginous margin and teeth *Lesser Water-parsnip* **Berula erecta**
 - Lflets 3-7 prs, rarely held in horizontal plane. Petiole with petrol smell; lflets with cartilaginous margin and teeth. R *Greater Water-parsnip* **Sium latifolium**

¹⁵ Vb (plural vb's) - Vascular bundles

◆ Petiole without ring-mark

- Stems rooting at least at lower nodes, hollow, weak sweet celery smell. Petiole without latex
 - Lfts (2)3-6 prs, 0.5-6(10)cm, lanc to ovate, sessile (but lowest pr often short-stalked to 12mm), crenate or shallowly lobed. Bracts 0-2(3) *Fool's-water-cress* **Apium nodiflorum**
 - Lfts 1-4 prs, 0.5-1.8cm, ± orb, almost as long as wide, sessile, ± 2-lobed to lobed and toothed. Bracts (2-6(-8)). VR. Sch8 *Creeping Marshwort* **Apium repens**

- Stems not rooting at nodes, erect

- Lfts linear, deeply lobed or entire (not toothed). Petiole with obscure latex

Upper lvs 1-pinnate with lfts 0.5-2cm, distant, obtuse, often cylindrical and hollow, sweetly celery-scented. Lower (and basal) lvs 1-2-pinnate. Stems to 80cm, to 8mm diam, often constricted at nodes, striate, thin-walled, v hollow. Often aquatic *Tubular Water-dropwort* **Oenanthe fistulosa**

- Lfts often broader, toothed (entire in linear lvs of *Oenanthe*), never deeply lobed

Petiole without latex

Lfts 1-3 prs, 1-5cm, broadly ovate to rhombic, stalked (uppermost sessile), shiny green esp below.

Petiole tough, sharply 5-7-angled, shallowly channelled, solid when young, later hollow, 5-7 vb's¹⁶

around margin, strongly celery-scented. Often coastal *Wild Celery* **Apium graveolens***

Petiole with white latex (often sparse)

Bracts 0 or several, ± vestigial. Fls July-Sept. Frs 2.5mm, ovoid, styles 0.6-1.4mm. Usu damp

brackish gsld *Parsley Water-dropwort* **Oenanthe lachenalii**

Bracts several, obvious. Fls Jun-Jul. Frs 3mm, cylindrical (± straight-sided), styles 2-3mm. Damp to

dry gsld *Corky-fruited Water-dropwort* **Oenanthe pimpinelloides**

¹⁶ Vb (plural vb's) - Vascular bundles

Group Z – Lvs 2-4-pinnate

- Stipels present (stipule-like outgrowths below each lft) often present on upper lvs
 - ◆ Petiole sheathing at base with fimbriate margins at least on upper lvs, wiry. Lfts net-veined, usu with 3 veins converging at each hydathode at each lobe apex..... *Common Meadow-rue* **Thalictrum flavum**
- Stipels absent
 - ◆ Stems and petioles purple-spotted
 - Plant fetid. Lfts 1-2cm, gland-dotted when dry. Petiole slightly flattened, striate, v hollow. Stems to 200cm, 5-angled to round, hollow *Hemlock* **Conium maculatum**
 - ◆ Stems and petioles not purple-spotted
 - Petiole channelled, latex present
 - Plant with white (or cream) latex. Lvs with purplish pinna junctions and hairs in lft axils; lfts 3 prs, 3-9 x 1-3.5cm, ovate (to lanc), asymmetric at base, occ with short stiff hairs above and on veins below, with narrow cartilaginous margins (occ purplish), net-veined, often with purplish veins. Petiole purplish at base, often laterally flattened, celery-scented, with hollow usu broader than long. Stems usu purplish, pruinose, round .
..... *Wild Angelica* **Angelica sylvestris**
 - Petiole not channelled, round or laterally flattened, latex absent
 - Lvs celery-scented, 2-3-pinnate, to 30cm; lfts all stalked (the lowest pr longest); lobes 3-9cm, linear-lanc, unequal at base, with narrow entire or weakly scabrid cartilaginous margins, serrate. Petiole hollow, stout, occ reddish nr base, weakly ridged, hollow. Stems to 150cm, round, striate, v hollow. Per. Apr-Oct. Usu aquatic *Cowbane* **Cicuta virosa**
 - Lvs strongly parsley-scented. Petiole with auriculate sheathing base, round to laterally flattened, solid or hollow. Lvs 3-4-pinnate; lfts deeply lobed; lobes 2-5(8) x 1mm, lanc to ovate, acute, v thin, with entire or weakly scabrid margins. Submerged lvs stiffer with flattened lobes. Stems to 150cm, round (finely striate), with large hollow, with dead lvs persisting at base. Tubers slender.....
..... *Fine-leaved Water-dropwort* **Oenanthe aquatica**
 - Petiole not channelled, round or laterally flattened, latex present (occ obscure). Lvs weakly parsley- or celery-scented (occ fetid)
 - Petiole solid, with latex drying orange-brown. Stems round, to 150cm
Lfts lanc to ovate, shiny, with narrow erose cartilaginous margins, toothed. Petiole with auriculate sheathing base, often with obscure slit above, with fetid celery odour. Stems stout, pith-filled or hollow
..... *Hemlock Water-dropwort* **Oenanthe crocata**
 - Petiole hollow or solid, with latex (often v sparse) not drying orange-brown
Stems round (finely striate), to 100cm
Basal (and lower) lvs (1)2-pinnate; lft lobes 0.4-2cm, linear-lanc to narrowly ovate-lanc, mucronate, often cylindrical and hollow. Upper lvs 1-pinnate with lfts 0.5-2cm, distant, obtuse, often cylindrical and hollow, sweetly celery-scented. Stems to 80cm, to 8mm diam, often constricted at nodes, striate, thin-walled, v hollow. Often aquatic *Tubular Water-dropwort* **Oenanthe fistulosa**
Stems ridged (often strongly so)
Stems to 12mm diam, ± pruinose, hollow. Lvs 2-4-pinnate, the lower soon withering; lobes 3-15 x 1(5)mm, linear-lanc. Infl rays hollow. Bracts few or absent. Frs 4mm, ± cylindrical, with styles 1-2mm.
Damp alluvial gsld *Narrow-leaved Water-dropwort* **Oenanthe silaifolia**
Stems 2.5-5mm diam, not pruinose, solid to hollow. Infl rays solid. Bracts few or several. Frs 2.5mm, ovoid, with styles 1mm *Parsley Water-dropwort* **Oenanthe lachenalii**

Abbreviations

< less than; << much less than

> greater than; >> much greater than

± more-or-less (qualitative); approximately (quantitative)

Br – Britain

Eng – England

fl – flower

fr – fruit

HTL – hold to the light

Ire – Ireland

lanc – lanceolate

lf – leaf

lft – leaflet

lvs – leaves

mtn – mountain

N, E, S, W – points of the compass

nr – near

occ – occasionally

opp – opposite

pr – pair

R – rare

Sch8 – Schedule 8 (of the Wildlife & Countryside Act 1981 (as amended))

Scot – Scotland

sp (plural spp) – species

TS – transverse section

usu – usually

v – very

var – variety

vb (plural vb's) – vascular bundles

VR – very rare

yr - year

Glossary

- Acute – sharply pointed
- Adnate – fusing together of two different organs e.g. stipules adnate to petiole
- Adpressed – lying flat against / close to another structure e.g. adpressed hairs against a stem
- Aerenchyma – tissue with tiny air holes, a common character of aquatic plants
- Antrorse – pointing forward or upwards towards the apex
- Apiculus – a short sharp point
- Auricle – a small lobe or ear-shaped appendage
- Bifid – divided to, or less than, half-way into two parts
- Bracts – leaf-like structures usu found where the flower stalks meet the stem (axil)
- Cartilaginous – resembling cartilage
- Ciliate/cilliolate – fringe of hairs
- Compound – leaves made up of several leaflets (pinnate or palmate)
- Connate – connected/joined together
- Cuneate – “wedge-shaped”
- Cuspidate – ending abruptly in a sharply pointed tip
- Elliptical – widest in the middle, tapering equally at both ends
- Fimbriate – a fringe of hair- or finger-like projections at leaf margins
- Glabrous – hairless
- Hyaline – very thin, colourless and transparent
- Hydathode – a gland that exudes water, usu confined to the apex and teeth of a leaf
- Intercalary lfts – lfts alternately large and small
- Ladder-fibrillose – the ladder-like pattern of fibrillae (small fibers) best seen on older sheaths in some *Carex* species
- Lanceolate – lance-shaped leaf, long and narrow (wider at the base and narrower at the tip)
- Ligule – a thin membrane or ring of hairs, it is found on the inside of the leaf where the leaf base meets the sheath
- Lobes – part-divisions or indents usu in leaves (shallowly- or deeply-lobed)
- Lyrate – pinnatifid, with the terminal lobe much larger than the others and usually rounded
- Mucro – a short stiff point, often an extension of the midrib
- Mucronate – with a mucro
- Obtuse – blunt; with a more or less rounded apex (at an angle $>90^{\circ}$)
- Ochrea (pl Ochreae) – stipules which have fused together forming a membranous sheath around the stem
- Orbicular – circular in outline
- Ovoid – oval or egg-shaped
- Palmate – more than 3 leaflets or lobes
- Papillae – small rounded or pimple-like protuberances
- Patent – spreading widely and straight ; at $\pm 90^{\circ}$ to a surface
- Petiole – a leaf stalk
- Pinna – primary division or leaflet of a compound leaf (which may be further divided)
- Pinnate – compound, with leaflets or pinnae arranged on opposite sides of a common stalk, with or without a single terminal leaflet; having veins along each side of the mid-rib of a leaf
- Pruinose – a frosted/white powdery coating that is easily rubbed off
- Pseudowhorled – alternate but closely spiralling leaves around a stem so as to appear whorled
- Rachis – the axis (excluding petiole) of either a compound leaf or an inflorescence
- Recurved – bent or curved downwards or backwards
- Reniform – kidney-shaped
- Reticulate – marked with a network pattern of veins

Retorse – (of a hair) bent or curved backwards or downwards
Revolute – (of a leaf in bud) with both margins rolled equally downwards
Rhizome – a root-like stem, usu lying horizontally under the ground
Rugose – markedly wrinkled
Scabrid – rough texture, often to the touch
Septum (pl Septa, ad Septate) – divisions/partitions
Sessile – stalkless (leaf/flower) joined directly to the stem
Sheaths – a tubular structure surrounding an organ or part of an organ
Spathulate – spoon-shaped, usually with a rounded apex
Stele – the central core of the stem of some plants; a cylinder of vascular strands
Stipel (pl Stipels) – a stipule-like structure outgrowth at the base of a leaflet
Stipules – a small herbaceous (or rarely spiny) appendage, normally in pairs at the base of the petiole
Suborbicular – nearly orbicular (nearly rounded)
Thalli (pl Thallus) – a body of a plant appearing without distinct stems or leaves e.g. Duckweeds
Trifid – divided to, or less than, half-way into three parts
Trigonous – three-angled, the angles blunt
Tubercles – small wart-like or knobby projections
Viscid – having a viscous or sticky texture