

# MOSES



by Robert H. Miller



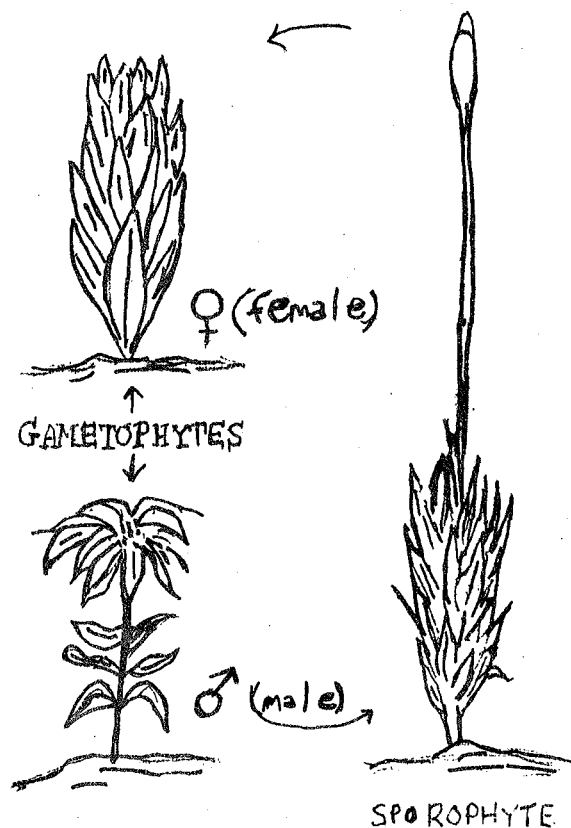


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## WHAT ARE MOSSES?

Mosses are low on the evolutionary scale of plants. They have no true roots and they do not have blossoms and reproduce by seeds, yet their life existence is an interesting one. To the beginner, the word moss is most confusing and rightly so. The word has been used commonly in reference to many small plants which are in no way real mosses. "Reindeer Mosses" are lichens - plants which combine algae and fungi into one plant unit. "Sea Moss" is a seaweed or algae. "Spanish Moss" is a true flowering plant. "Club Mosses", commonly known as "Ground Pine" and "Ground Cedar", are Lycopodiums.

Mosses are really small plants which have stems and leaves that contain chlorophyll (a green colored substance) which, with the aid of sunlight, is able to manufacture its own food. They have no





true roots; only little branches called rhizoids which are used for anchorage and not for procurement of food.

Unlike more highly developed plants, mosses have no vascular system to conduct liquids up to the leaves from the rocks, wood or soil on which the plant lives. The moisture has to be absorbed through the leaves and stems. For this reason, the appearance of mosses is constantly changing with the amount of moisture present in the habitat or atmosphere. Leaves can be dry and shriveled and, in a matter of minutes, change through added moisture to a plant with erect stems and leaves. Its adjustment to periods of long drought is amazing. A. J. Grout states in *MOSSSES WITH A HAND LENS* that some mosses "have become so hardened to the lack of moisture that they have retained their vitality on the herbarium shelves of the museum for several years and have started to grow when moistened."

Mosses possess a most peculiar life cycle commonly known to the biologist as "alternation of generations". In one generation there appears male and female plants (gametophytes). The female plant has slender, erect leaves on the top of the plant while the male leaves are usually more stout and somewhat spread. They look like a rosette with a reddish center, and sperm are developed from the center of this rosette. In the top of the female plant, eggs develop. The mature sperm break away from the male plant and swim in dew or rain to the eggs in the female plant and if fertilization takes place, a seta (stem) arises with a capsule on the tip. This is known as the (sporophyte) a sexual stage. In this capsule develop the spores. These escape through the capsule's teeth in dry weather. Those which land in favorable places will grow into new plants, approximately half, being male and half female. With many mosses, in the

gametophyte stage, the characteristics of the male and female plants may not be evident except when they are mature. When mature, the sex can be readily recognized. Mosses that reproduce in the above manner always alternate from the sexual generation to asexual, etc.

Not all mosses reproduce by "alternation of generations". Some always grow from the spreading of the branches of the plants and still other species produce little sacs on the branches in which grow small spore-like bodies called "gemmes". These gemmes, when fully mature, break away from the parent plant and are blown away by the wind. If they land in suitable habitats, they will grow into plants similar to their parents.

#### MOSS GROUPS

All mosses are Bryophytes. There are three groups and we have representatives of each group in Maine.

1. Sphagnales commonly called peat mosses. These are easily found in bogs and moist areas. When once recognized, these should never be confused with other mosses. The plants form large mats or tufts of light green often tipped with red. Most plants have multiple fruits on short stems (seta). Anyone who has once walked on this moss is amazed at how soft and spongy it is. The sphagnum mosses are normally associated with cool, moist habitats and are therefore very common in Maine. Most people are familiar with peat bogs or moors where this moss is in abundance, although it is

easily found in moist, wooded areas. Many people not familiar with peat mosses find it difficult to select the different species, but three or four may be recognized early.

2. Adreaeales (Black Moss). Only one species is found in Maine and, as its name implies, it is very dark and often black. Almost always found on moist granite or salty rocks and usually at high elevations.
3. Bryales (True Mosses). Since there are only a few species of Peal or Black Mosses, nearly all specimens collected will be Bryales mosses. If the beginner can group many of these into families, it will simplify identification and result in less confusion. A few of such families are:
  - a. Hairy Cap Mosses
  - b. Broom Mosses
  - c. Bryum Mosses
  - d. Mnium Mosses
  - e. Fern Mosses
  - f. Hypnum Mosses
  - g. Beaked Mosses
  - h. Water Mosses

SUGGESTIONS FOR COLLECTING, MOUNTING AND PRESERVATION  
OF MOSS SPECIMENS

HABITATS

When studying and collecting mosses the beginner should always be very conscious of the habitats or surroundings in which a specie grows.

COLLECTION OF SPECIMENS

In the collection of mosses care should be taken not to injure the specimens before they can be identified. Specimens should not be piled on top of each other. Many species, such as Wavy Catharinea, Bog Moss, and some of the Mniums, quickly begin to shrivel and curl when removed from their naturally moist habitats. Many collectors find it best to place such specimens in covered jars in order to reduce drying.

FRUIT

Whenever possible, specimens should be collected in fruit. As there are many different shapes and arrangements of capsules, certain species could not be determined unless the fruit were present. Mosses have a particular time of year when each specie fruits, conditions being favorable. Therefore, some knowledge of the periods of maturing capsules is helpful in the recognition of specimens which have similar appearances.

After mosses have been cleaned and before identification, a small cake tin or deep plate with water is ideal to revive dried and curled mosses. Frequently the change in the appearance of the moss is so great that only then can determination of the specie be assured. In this way moss may change from curved to erect branches.



Leaves may straighten from the stems revealing the characteristics of midribs, leaf shapes, and toothed edges. A variety of these mosses is often used to make miniature moss gardens and labels with names are stuck on tooth picks. These moss gardens make very attractive table pieces.

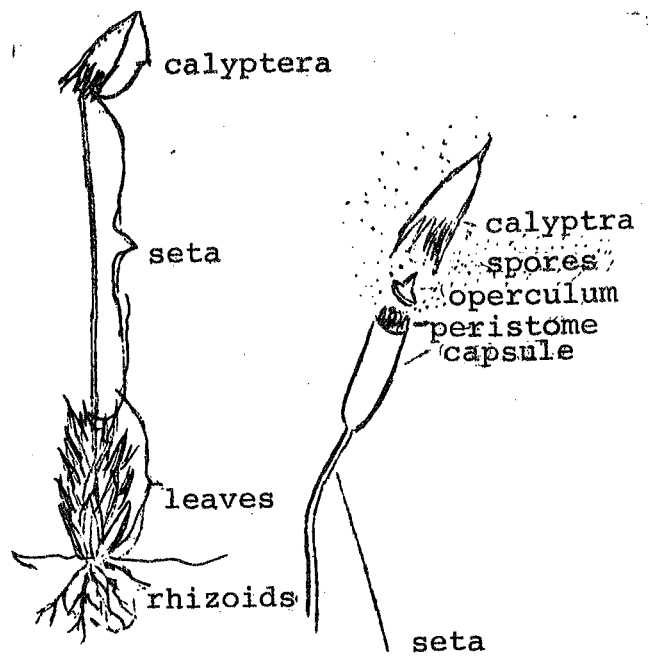
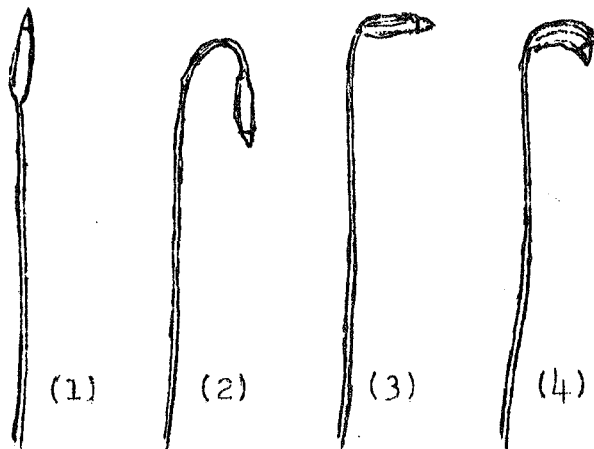
#### PRESERVATION OF SPECIMENS

Methods used in the preservation of specimens vary greatly. Many prefer to dry specimens. Most mosses can be just dried in an open room. A few species which grow in moist habitats, change so greatly in appearance, when dried, that the beginner might not recognize the original form. For this reason, some people press the specimens, carefully, in absorbent driers (such as blotters), and thus keep the leaves expanded as in their natural state.

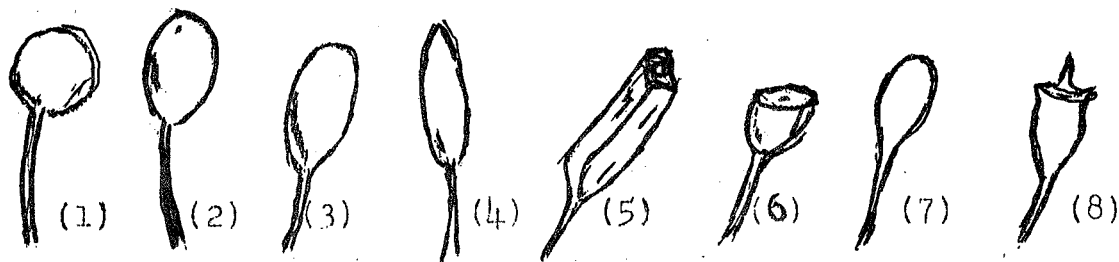
After drying, the plants may be placed in folded paper envelopes or cellophane bags or on cards covered with cellophane. Mosses, so kept, will fade in color if permanently exposed to sunlight. If a library of specimens is desired, the mosses should be placed in covered containers of some form. If color is secondary to structure in the mind of the collector, he can preserve thoroughly cleaned specimens in small vials of formaldehyde (20 parts water, one part solution). The color of the specimens fade to pale yellow, but the structure remains true. One familiar with the use of liquid plastic can make very attractive blocks with imbedded mosses. These hold both shape and color remarkably well, but are very expensive.

## OVER-ALL PICTURES OF THE CAPSULES AND SETAE

- (1) Erect Capsule
- (2) Hanging, or Pendant Capsule
- (3) Inclined Capsule
- (4) Grooved Capsule



## TYPES OF CAPSULES

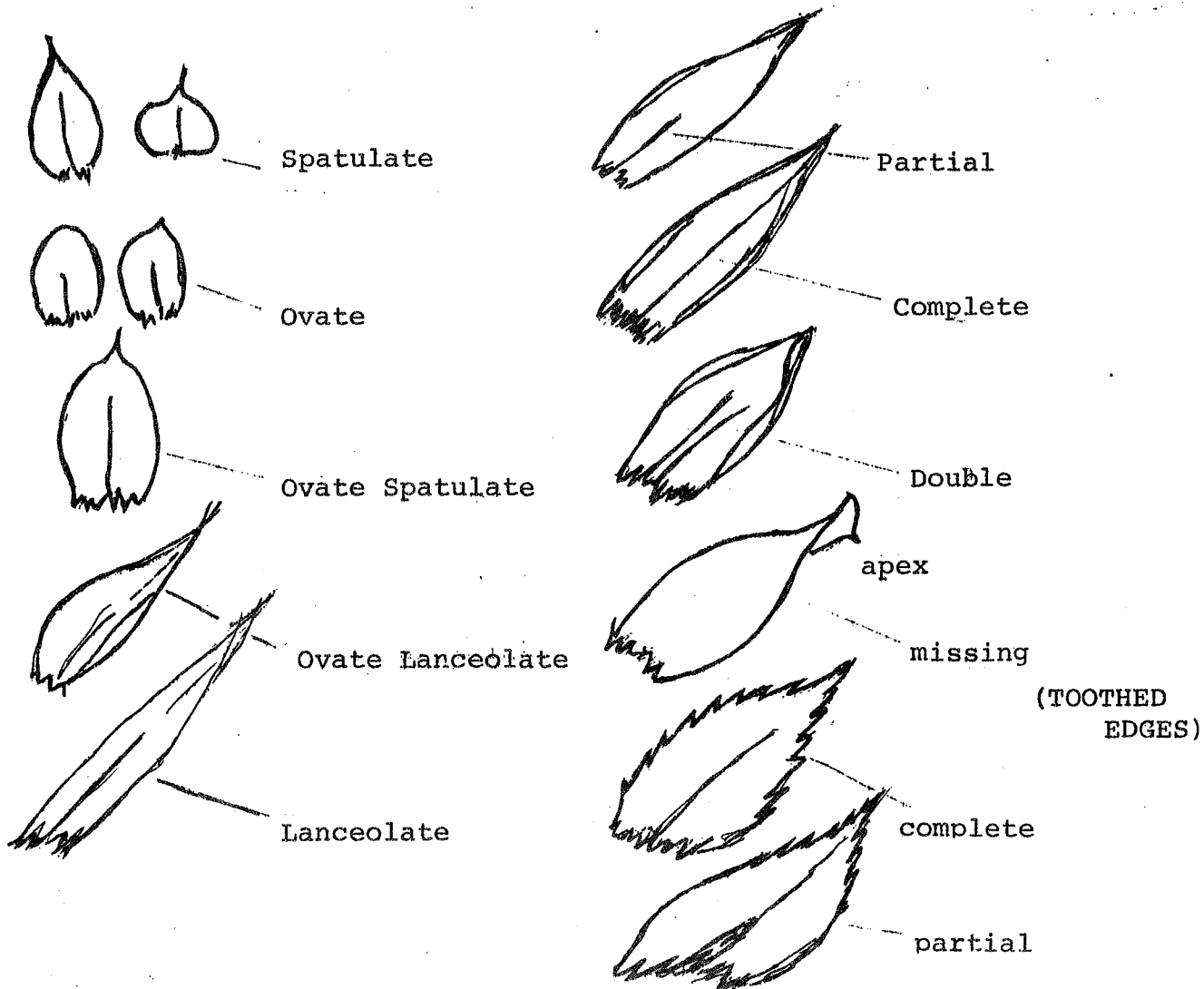


- |                 |                     |
|-----------------|---------------------|
| (1) Spherical   | (5) Four-sided      |
| (2) Ovoid       | (6) Urn-shaped      |
| (3) Elliptical  | (7) Pear-shaped     |
| (4) Cylindrical | (8) Umbrella-shaped |

# TYPES OF LEAVES

(SHAPE)

[MIDRIB (COSTA)]



## GLOSSARY

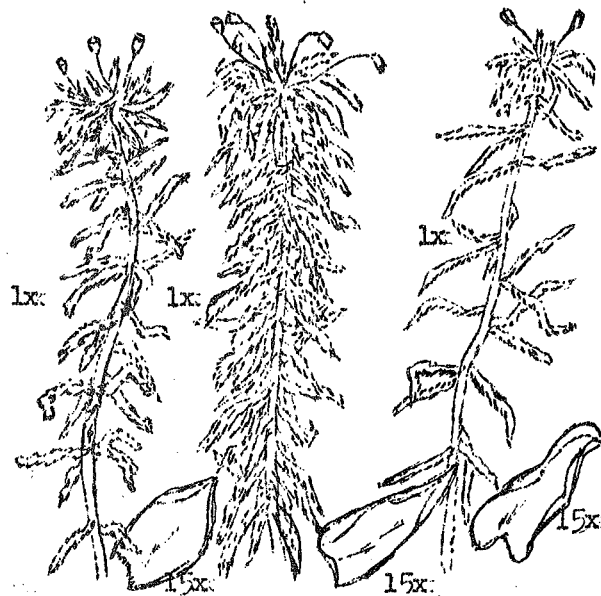
|                            |   |
|----------------------------|---|
| Acute                      | - with a sharp point  |
| Alternation of Generations | - successive generations alternating from gametophyte to sporophyte or visa versa             |
| Apex                       | - the point or tip of the leaf  |
| Calyptra                   | - a hood or covering over the upper end of the capsule  |
| Capsule                    | - the fruit or sac which contains the spores  |
| Costa                      | - the midrib or vein in the leaf  |
| Egg                        | - the female sexual cell or gamete  |
| Fertilization              | - the union of egg and sperm  |
| Flagella                   | - fine string-like branchlets   |
| Fruit                      | - same as capsule   |
| Gametophyte                | - the male or female plant  |
| Gemme                      | - a bud-like body on leaves capable of reproducing the specie                                 |
| Habitat                    | - the immediate surroundings or environment   |
| Operculum                  | - the cap or lid which covers the mouth of the capsule  |
| Primary                    | - referring to original growth, usually prostrate, from which grows the erect secondary stems |
| Rhizoids                   | - minute rootlets   |
| Rosette                    | - radiating petals  |
| Secondary                  | - the younger ascending or erect branches that grow from the primary stem                     |
| Seta                       | - the stem which holds the capsule  |
| Sperms                     | - the male sexual cell or gamete  |
| Spore                      | - a minute body contained in the capsule capable of reproducing mosses                        |
| Sporophyte                 | - the spore bearing plant   |
| Teeth                      | - the outer finger-like divisions about the mouth   |
| Toothed                    | - serrated or notched as on the edge of a saw   |
| Tufts                      | - a cluster or bunch of mosses  |
| Veil                       | - the calyptra  |

OUTLINE KEY TO SOME MAINE MOSSES

- I. Three or more capsules to a single plant  
Erect growing mosses in acid bogs or woods  
Light green to reddish in color  
Four or more capsules with short seta and no calyptra
- II. One or two capsules only to a single plant tip  
Erect, clustered single plants with few if any branches  
Most plants growing on soil, rotten logs or rocks  
(Numbers 1 - 11 usually over 1 inch tall)  
(Numbers 12 - 20 seldom 1 inch tall)
- III. Prostrate fern-shaped moss plants growing on soil, rotten logs, or rocks in moist woods
- IV. Prostrate to partially erect plants with irregularly branched or incomplete fern-shaped appearance.  
Usually growing on soil  
Sometimes on rotten logs or well shaded rocks
- V. Mosses growing on rocks or twigs submerged in streams, springs or ponds
- VI. Mosses growing on stumps or tree trunks

## I. Mosses Erect - Single Plants

Bogs and wet wood areas - plants 4" to 10" high  
Capsules globar or ovoid  
No peristome or beaked operculum  
Plants usually cream, light green or red color  
Peat mosses



|              |            |              |
|--------------|------------|--------------|
| Sphagnum     | Sphagnum   | Sphagnum     |
| palustre     | squarrosum | capillaceum  |
| SPOON LEAVED | SQUARROSE  | ACUTE LEAVED |
| PEAT MOSS    | PEAT MOSS  | PEAT MOSS    |

### SPHAGNUM MOSS (Sphagnum)

Peat mosses are common in any swamp or wet wooded areas. Unlike true mosses the top of the plants are busy and are light, yellow green or reddish. After a late summer drought they fade to a yellowish white or dirty pink. Although there are several species only three are considered here. The Spoon Leaved Peat Moss, yellowish green in color, has a moderate number of branchlets. Leaves are spoon shaped, with no midrib or teeth. The Squarrose Peat Moss is yellow green, frequently with a bluish hue. The dense branchlets are slender and the leaves are longer than those of the other common species. The Acute Leaved Peat Moss is green to red or purple in color. Branchlets are long and slender but usually more thinly scattered up and down the stem than the other species. Leaves are pointed but somewhat broader than the Squarrose Peat Moss.



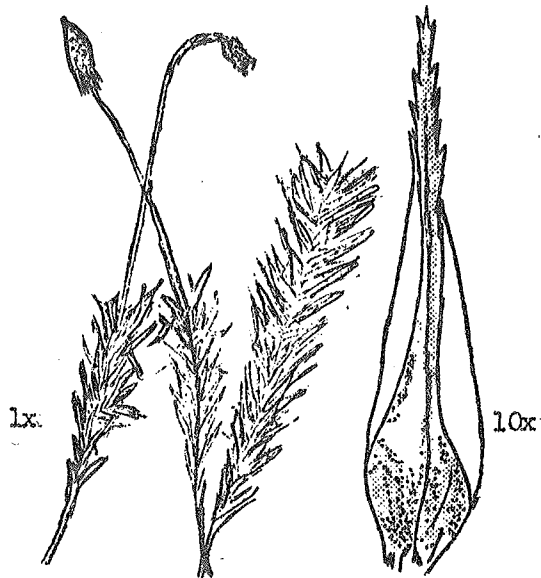
II. Growing on soil (plants 1" to 10" high)

1. Tall plants (long serrated leaves)

a. Hairy Cap Mosses (*Polytrichum*)

64 teeth on peristome

Common Hairy Cap - deep green color - *P. commune*



HAIRY CAP MOSS

Capsule at upper left is immature with calyptra.

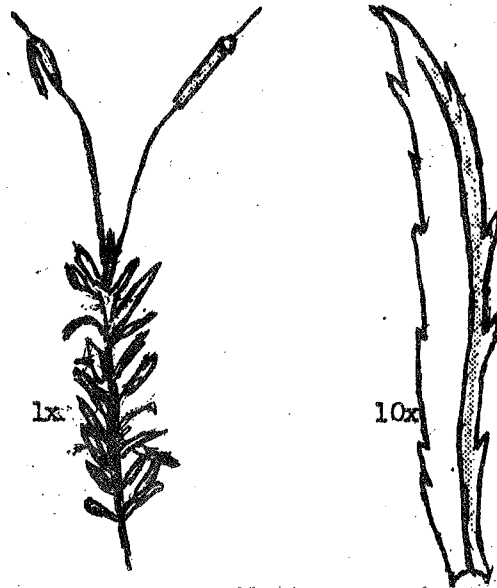
Capsule at the right is older and calyptra is removed.

HAIRY CAP MOSS (*Polytrichum commune*)

This moss grows on soil in loose patches or large carpets. Commonly found in shady sandy areas, often under young pine or in old fields or pastures. Leaves are medium to dark green. Stem is reddish brown at the base becoming green nearer the top. The plant frequently gives the appearance of a hemlock sapling. The leaves spread open when wet and curl when dry. The long lanceolate leaves have toothed spear points on the end and a midrib the entire length. This specie gets its name from the fact that in fruiting season the calyptra resembles a light tan hairy cap which covers up the capsule. The cap doesn't last long, blowing away and revealing a four-sided capsule.

b. Juniper Hair Cap - gray green color - *P. juniperinerium*

2. Wavy Catharinea (*Catherinea undulata*)



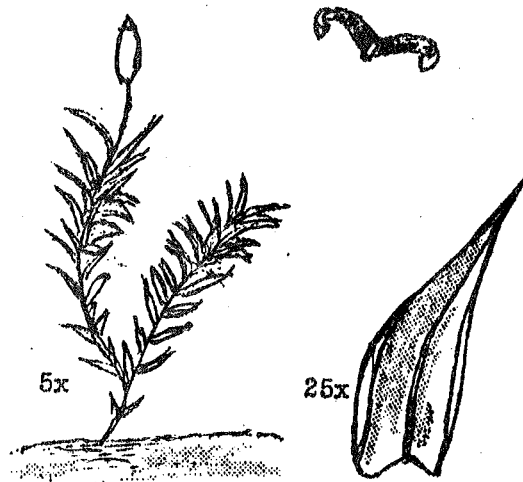
WAVY CATHARINEA

Capsule left with calyptra. Right capsule-calyptra absent, operculum is present.

WAVY CATHARINEA (*Catharinea undulata*)

The catharineas closely resemble Hairy Cap mosses in general appearance. Leaves are medium to dark green, but grow out of a green stem. This moss frequently blankets the banks of shady brooks. Leaves have sharp scalloped sides with a midrib the entire length. Once this moss is removed from a moist habitat the leaves curl as they dry, making it almost impossible for a beginner to recognize it. Wavy Catharinea often produce capsules in pairs. Peristome has 32 teeth.

3. Rock Orthotrichum (*Orthotrichum anomalum*)



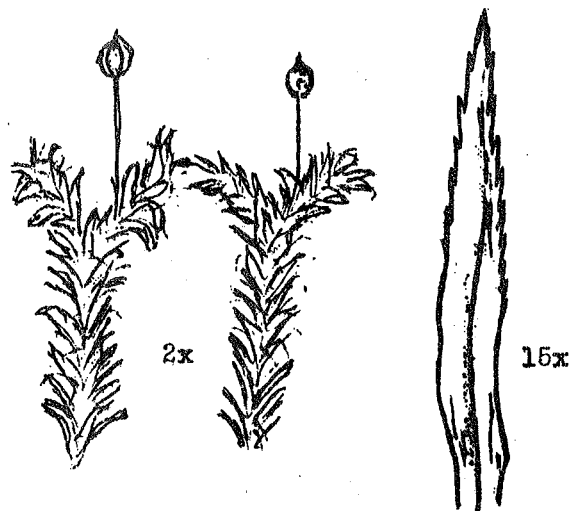
ROCK ORTHOTRICHUM

Upper right - cross-section of the leaf showing incurved structure.

ROCK ORTHOTRICHUM (*Orthotrichum anomalum*)

Closely resembles the Common Orthotrichum but grows on rocks. Grows as tufts or mats on ledges and boulders in both open and wooded areas. Color is dark, olive green on top of plants; lower parts are more aged and brownish. There is a short but noticeable seta which is not evident in the Common Orthotrichum. Capsules are erect. Spores change from yellowish color to a brownish red when maturing and are ripe by midsummer. Leaves are long, lanceolate with a complete midrib. Leaves curl in a roll along edges. (Note cross section of diagram.)

4. Apple Moss (*Bartramia pomiformis*)



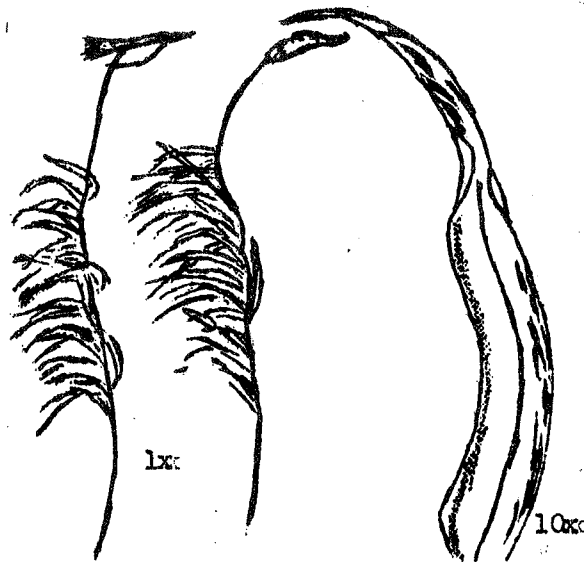
APPLE MOSS

Plant left with old and grooved capsule.  
Plant right - young capsule with calyptra.

APPLE MOSS (*Bartramia pomiformis*)

This moss is soft and bright green. It grows in thick tufts and cushions along moist banks and ledges. The long (often twisted) leaves appear somewhat kinky in dry periods and are spread and soft in moist periods. By early June the moss is well fruited with capsules which so closely resemble little green apples that the moss is so named. By midsummer seta and fruit are both reddish brown and the fruit is much shrunken and somewhat grooved.

5. Common Broom (*Dicranum scoparium*)



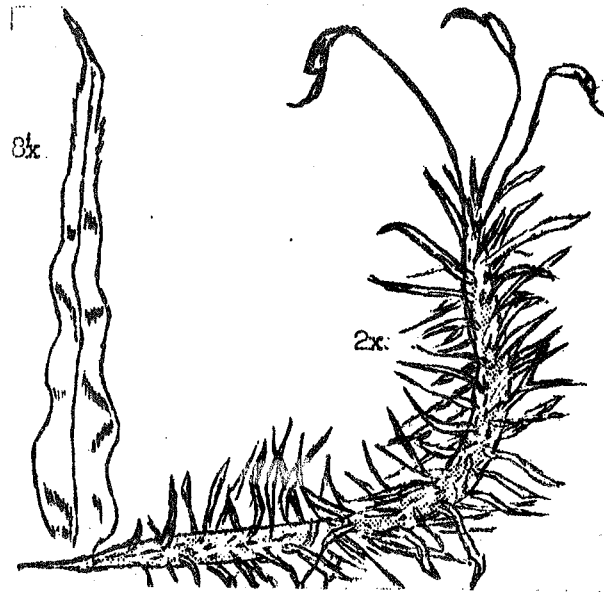
COMMON BROOM

Left plant with calyptra present.  
Plant right - calyptra absent -  
operculum present.

COMMON BROOM (*Dicranum scoparium*)

Commonly found in the woods on moist soil, on decaying logs, and in between rocks, it forms symmetrical cushions or irregular mats, which rise out of the needled or leaf covered soil. As is typical of most broom mosses, the leaves are deflected to one side of the stem, giving the appearance of being wind blown or like the curved bristles of an old counter brush. Leaves are long and incurved with an awl shaped point. Color medium green. Peristome has 16 teeth.

6. Wavy Broom (*Dicranum undulatum*)



WAVY DICRANUM

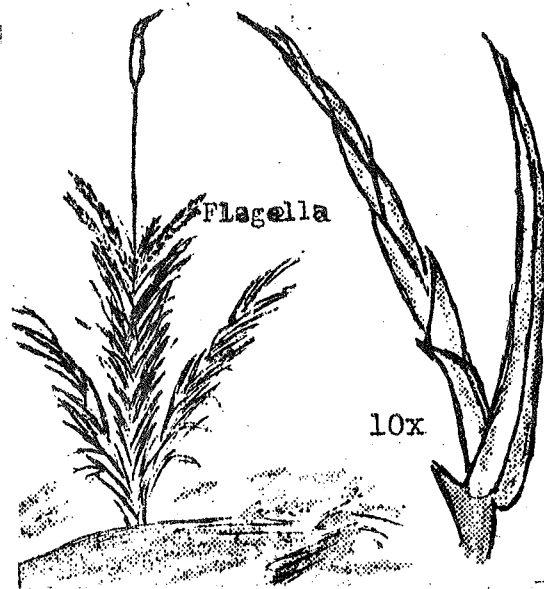
Enlarged leaf showing wavy structure.  
Right - plant with multiple fruit.

WAVY DICRANUM (*Dicranum undulatum*)

A robust specie growing in moist wooded areas. Leaves are bright green, long and waved along the edges like stretched crepe paper, a characteristic for which the moss is named. Apex is finely toothed. Stem is very noticeable, often being as much as 1/4" thick and very pale, grey-green in color. Capsules appear by midsummer, usually quite erect with a long beak. Later they curve with an angling beak. This is one of our few common mosses which has several seta growing from one plant. Peristome has 16 teeth.



7. Flagellated Dicranum (*Dicranum flagellare*)



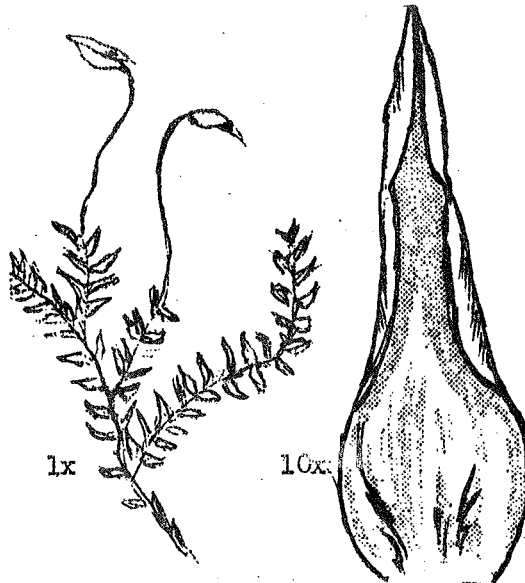
FLAGELLATED DICRANUM

Flagella - notice view at left. Enlargement at the right shows the leaf and flagellated structure.

FLAGELLATED DICRANUM (*Dicranum flagellare*)

Common as bright green tufts in deep woods, usually growing on decaying stumps or logs. The leaves are long, slender and hairlike and when dry they curl the entire length of the leaf. On many plants at the tops, there are fine, leafy projections with hair-like tips, called flagella. This particular characteristic identifies this species. The capsules are erect with a yellow split veil calyptra. Peristome has 16 teeth.

8. Cushion Moss (*Leucobryum glaucum*)



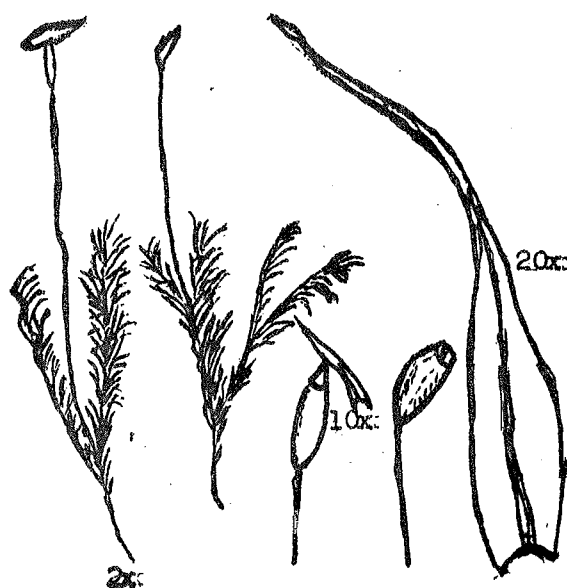
CUSHION MOSS

The plant, natural size left, with veil calyptra. Capsule operculum exposed. Capsule right, operculum exposed.

CUSHION MOSS (*Leucobryum glaucum*)

Common in any moist wooded area. The pale greenish gray-white tufts resemble pin cushions. After a long rainy period they frequently appear in deep green. The leaves are long and narrow incurving at the tips. No midrib present. When dry the cushions break apart readily revealing the brownish dead leaves near the base. The top leaves are commonly deflected to one side as in broom mosses. Peristome has 16 teeth.

9. Little Forked Moss (*Dicranella heteromalla*)



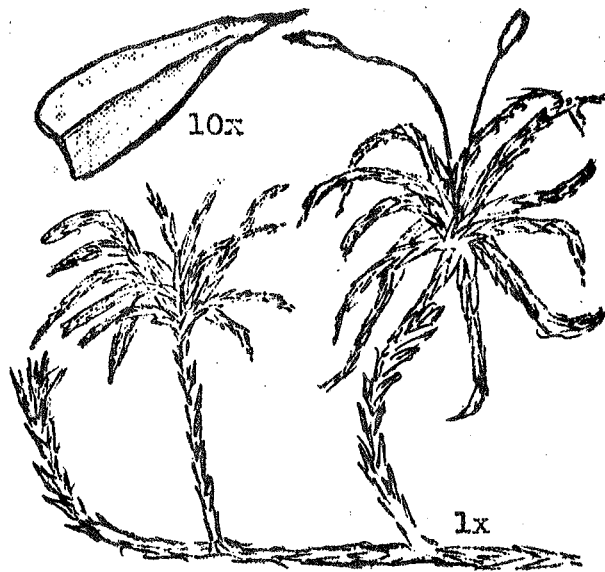
LITTLE FORKED MOSS

Both left plant and left enlarged capsule show the split veil calyptra. Second view from left shows calyptra absent, operculum present. Fourth drawing shows old, grooved capsule.

LITTLE FORKED MOSS (*Dicranella heteromalla*)

This moss grows commonly on clay or sand banks in shaded areas, in thick tufts of green. The individual plants tend to fork relatively, uniformly, thus giving the name of the specie. Leaves are long and very slender with an enlarged portion at the base. They have the habit of bending to one side or the other. The seta which rises out of the fork is a bright yellow but may darken with age. Capsule is usually erect but may curve and become grooved when old. Calyptra has a long, split ceil, resting at a sharp angle. The operculum forms a long beak. The elliptical capsule is brown.

10. European Tree Moss (*Climacium dendroides*)  
American Tree Moss (*Climacium americanum*)



EUROPEAN TREE MOSS

Plants growing from underground stem.  
Older plants grow from older portion  
of stem.

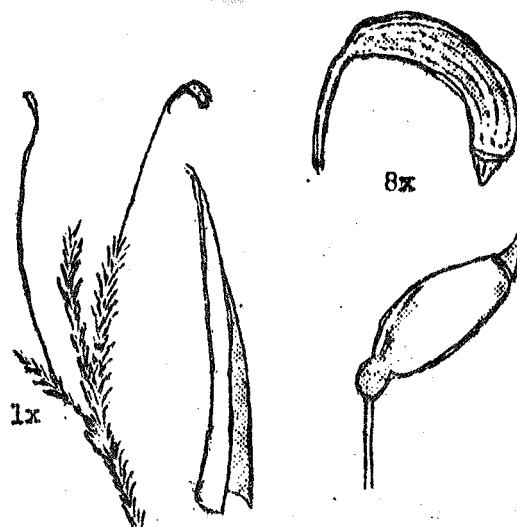
EUROPEAN TREE MOSS (*Climacium dendroides*)

Dark green moss commonly found in moist wooded areas and resembles miniature palm trees. Often found about rotting wood in swamps and on the banks of streams. It grows on a sub surface stem which is easily noticed when pulled up. Leaves press close along the stem rather than extend outward. Individually the leaves are finely toothed at tip with a midrib extending part way the length. Reddish-brown fruits are not uncommon growing erect in a long cylindrical shape.

AMERICAN TREE MOSS (*Climacium americanum*)

Has leaves more closely compressed to the branches.  
Less common in Maine.

11. Ribbed Bog Moss (*Aulacomium palustre*)



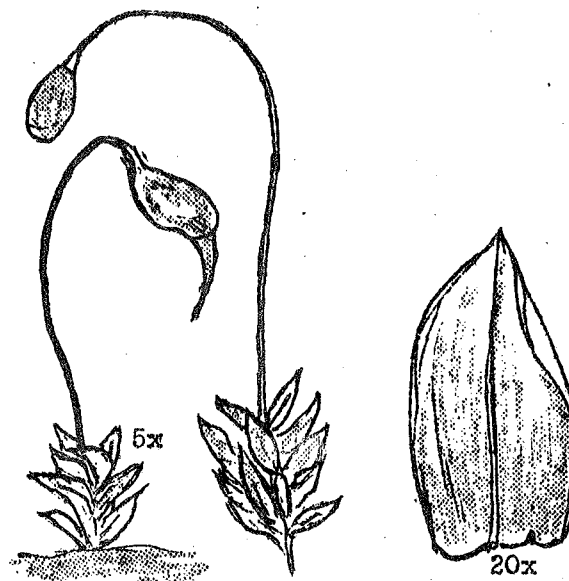
RIBBED BOG MOSS

On plant left - capsule with calyptra.  
Right capsule old and grooved. Above  
enlargement - old grooved capsule.  
Below - young capsule.

RIBBED BOG MOSS (*Aulacomium palustre*)

Found in moist fields, along roadsides and swampy areas, the plants are light yellow-green. Leaves long narrow, erect when moist, curled and distorted when dry. Capsules erect to inclined, smooth and green in color. The seta is a reddish brown. The seta grows either from the tips of the plants or from the base of its branches. By midsummer the capsule is curved or pendant, brownish, often shrunken displaying parallel ridges - the characteristic which gives this moss its name. When collected, this moss should be kept in a moist container.

12. Cord Moss (*Funaria hygrometrica*)



CORD MOSS

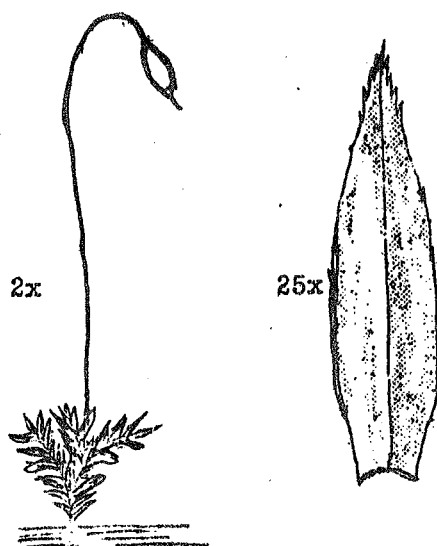
Plant left with long rakish operculum.  
Plant right, operculum absent.

CORD MOSS (*Funaria hygrometrica*)

Common in areas recently burned over, old ash piles and recently disturbed soil - appearing in large bright green blankets, frequently confused with the Common or Matted Bryum, but if the calyptra is present, it angles sharply off to one side, while it is straight in the Matted Bryum. Seta is long and becomes reddish brown with age, leaves are broad and light green.



13. Common Bryum (*Bryum caespiticiu*m)



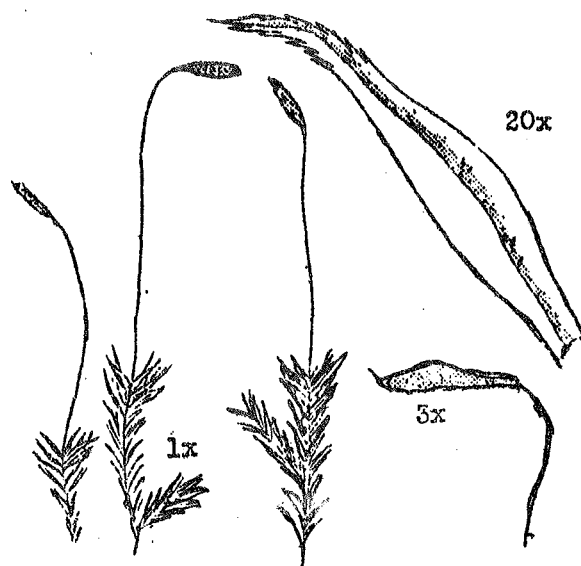
COMMON BRYUM

Plant with capsule and operculum.

COMMON BRYUM (*Bryum caespiticiu*m)

Common in open fields, dry bare spots, and frequently on patches of soil which has gathered on ledges; also on old gardens, ash piles and the like. Because of similar habitats it is often confused with cord moss. Leaves are usually light green, small ovate, lanceolate, and apex toothed. Midrib runs entire length. Plans are often branched. Fruits are common in May and June, green in the beginning and gradually becoming reddish brown. The drooped or pendant appearance of the fruit, with straight pointed beak distinguishes it from Cord Moss. Seat is three or four times the length of the plant.

14. Nodding Bryum (*Pohlia nutans*)



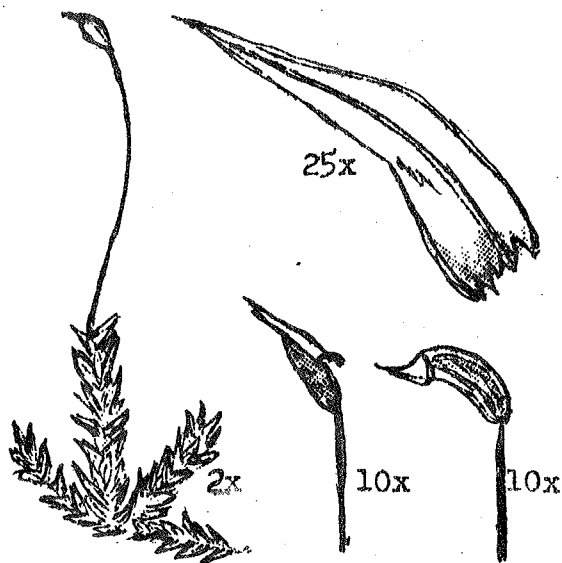
NODDING BRYUM

Mature plants with capsules at left.  
Lower right enlargement of the complete capsule.

NODDING BRYUM (*Pohlia nutans*)

This moss is frequently associated with moist, rich soil or rotting wood. Plants are dark green above and dull brownish below. Leaves are all long, lanceolate invariably pointing upward. Although the midrib is pronounced it does not extend beyond the apex. Apex only is toothed. The top group of leaves of this moss are bushy and longer than the bottom ones. As this moss fruits early in the season it can usually be distinguished from the other Bryums by its long reddish brown seta and a capsule which commonly is inclined or even pendant. Capsule is shaped like a tenpin. The long seta nods back and forth in the wind, giving the moss its name.

15. Purple Ceratodon (*Ceratodon purpureus*)



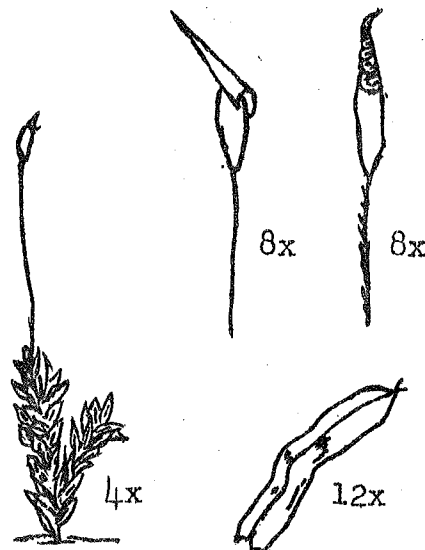
PURPLE CERATODON

Plant left with fruit. Capsules enlarged - at left with split veil calyptra. Capsule right, old and grooved.

PURPLE CERATODON (*Ceratodon purpureus*)

This moss is common in many habitats - ledges, pastures, roadsides, barren soil, old lawns, and burned over areas and even on old shingled roofs. The dark green plants often give the appearance of a velvet covering and are difficult to identify without fruit. The plants are somewhat branched and seldom over 1/2 inch high. The leaves are very small with a pronounced heavy midrib. As the moss fruits, the seta, which is a yellow green at first becomes a wine red when mature. The capsule early takes on an elliptical shape of purplish red later tending to become inclined and curved with four or five noticeable grooves. When in full fruit, the capsules are numerous, and at a distance have a distinctly purplish luster, thus giving the moss its name. When old, the reddish purple color changes to brown.

16. Common Barbula (*Barbula unguiculata*)



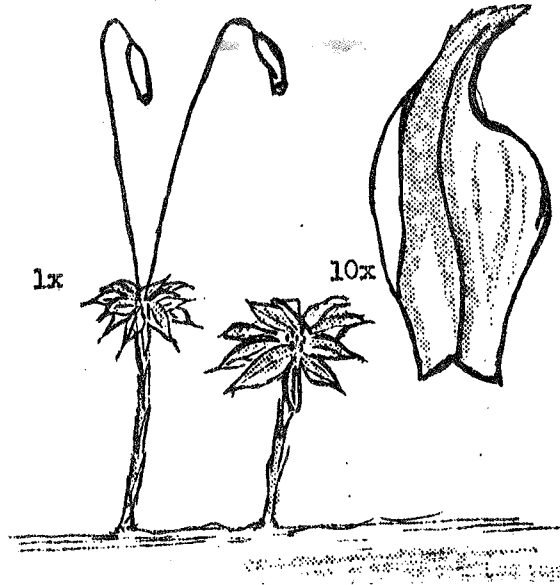
COMMON BARBULA

Upper left, capsule with split veil calyptra.  
Upper right, the calyptra and operculum removed showing long hairlike teeth.

COMMON BARBULA (*Barbula unguiculata*)

This moss grows on recently exposed, damp soil, stone walls, or boulders. It grows in tufts of medium to dark green often discoloring to a dirty shade. Plants are small, usually under 1/2 inch in height. Leaves are long and rounded at the apex. Midrib is strong and extends beyond the end of the leaf as a pin point projection. When moist the leaves are well extended; they curl when dry. Capsules appear in late fall or early spring and when present they assure correct identification. Seta is a red-brown. As it dries, it twists many times like the bands on a barber pole. Capsule is long and cylindrical. When young it has a split veil calyptra. After this is gone, extremely long twisted teeth are revealed. Although this moss is common, most beginners pass it by. One should be constantly looking for it, as it is a most interesting specie.

17. Giant Bryum (*Bryum rosum*)



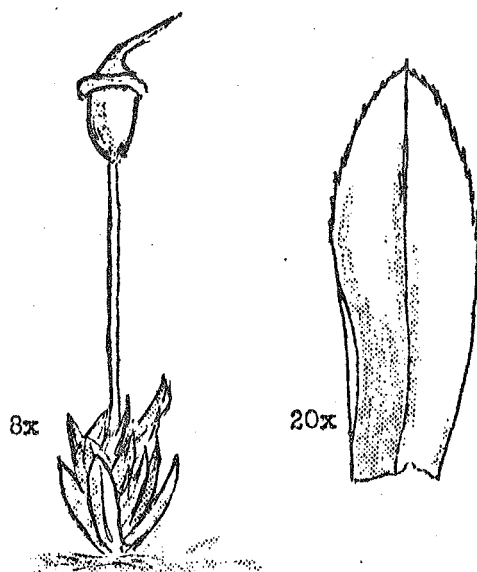
GIANT BRYUM

Plant left, with capsules. Mature male plant at right.

GIANT BRYUM (*Bryum rosum*)

This moss is found growing on rotting wood or soil covered rocks in moist, shaded areas. The dark green leaves grow out from the top of the stem as rosettes much like the petals of a daisy. Commonly this species is found singularly scattered between other mosses but may be found in tufts entirely of this species. Leaves are finely toothed on the apex with a midrib the entire length. This moss rarely fruits in America.

18. Common Urn (*Physcomitrium turbinatum*)



COMMON URN

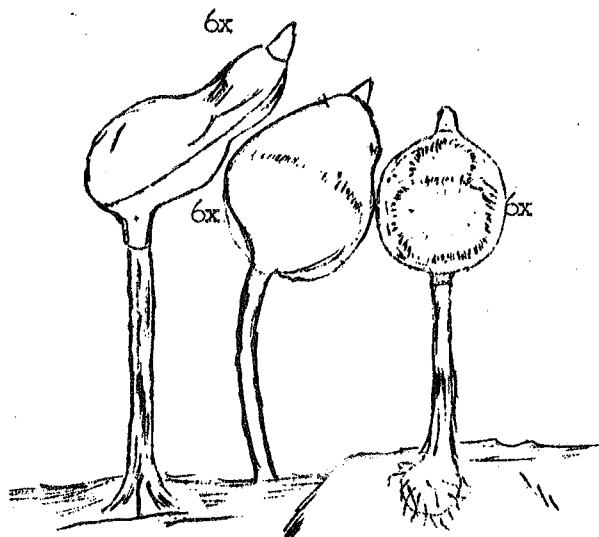
Plant with capsule and calyptra.

COMMON URN (*Physcomitrium turbinatum*)

Common along paths, in greenhouses, gardens and old fields. Plants are short, light green in color. When not in fruit, patches of this moss look like a short, napped rug. It is difficult to distinguish this from several other mosses, except when it is in fruit. Individually the leaves are long, ovate and finely toothed on the upper margins, with a midrib the entire length. Yellowish fruit is common by mid-May becoming reddish brown in June. The presence of the capsule is the identifying characteristic. Before the calyptra leaves in May it angles to one side. When it has gone, the capsule looks like a little urn; hence the name of the specie.



19. Humpbacked Moss (*Buxbaumia aphylla*)



HUMP BACKED MOSS

Left to right: Profile view, underside view, top view.

HUMPBACED MOSS (*Buxbaumia aphylla*)

This interesting moss grows in moist, shady soil which is usually barren of other noticeable vegetation. The plants are very small making the earth appear coated with a greenish-brown covering from which the fruit grows in the spring. The over-all height of the fruit is 1/2 to 3/4 inch and at first is glossy, reddish brown but by fall is somewhat shrunk and a duller color. Although this moss is not common, one should be constantly looking for it whenever in the right habitat.

20. Little Webera (*Webera sessilis*)



LITTLE WEBERA

Upper view showing minute leaves at base of capsule. Both views show perichaetial leaves and capsules.

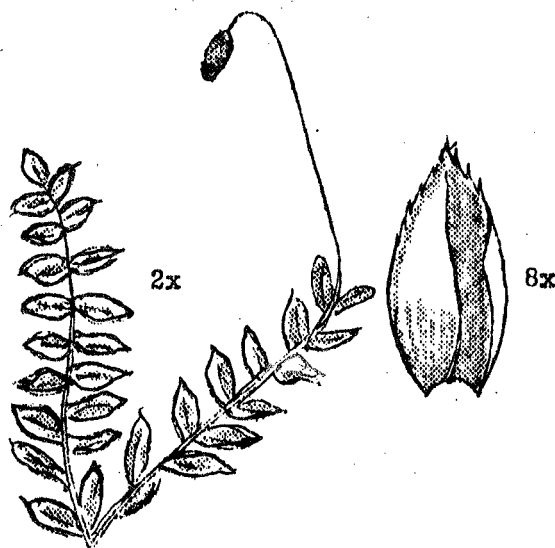
LITTLE WEBERA (*Webera sessilis*)

This odd moss grows in shaded road cuts or shaded moist banks that have been disturbed in recent years. Leaves are dark green and scarcely noticeable to even the experienced collector. Earth appears to be coated with dark green paint. Capsules are light tan in color and look like grains of wheat or oats. Many hair-like (perichaetial) leaves grow about the capsules which sets at an angle, all tilting in the same direction. Fruit matures in midsummer.

III. Prostrate fern-shaped moss plants growing on soil, rotten logs or rocks in moist woods.

A. Fern-shaped mosses with ovate to spatulate pinnae

1. Woodsy Mnium (*Mnium cuspidatum*)



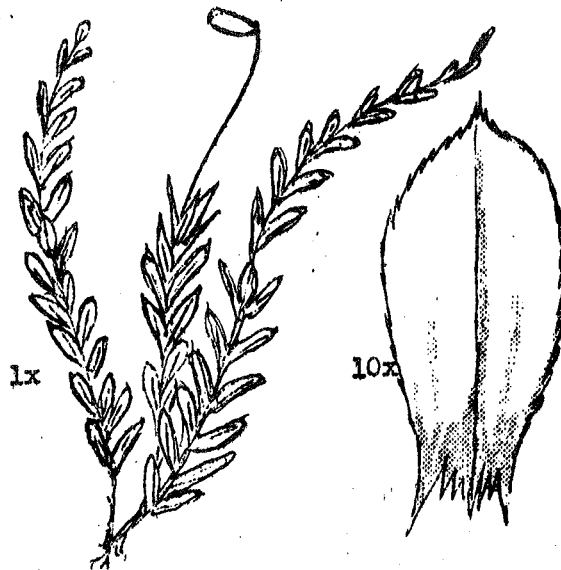
WOODSY MNIUM

Plant at left, sterile. Plant right,  
with fruit.

WOODSY MNIUM (*Mnium cuspidatum*)

Common on shaded lawns, banks and wooded areas. Lays flat on the ground and is often passed unnoticed. Since it resembles the leaves of some flowering plants many do not associate it as a moss. Plants growing in moist wooded areas are more erect and easier to detect. When dry the plants become curled and distorted as is typical of most *Mniums*. Therefore it is best to obtain fresh moist specimens. Leaves are bright green and appear ovate but with hand lens small teeth may be detected on upper half of the leaves. Midrib extends the entire length of the leaf. Capsules mature by mid-May in large numbers. Sometimes both seta and capsule are green, but gradually become reddish brown.

2. Toothed Mnium (*Mnium affine ciliare*)



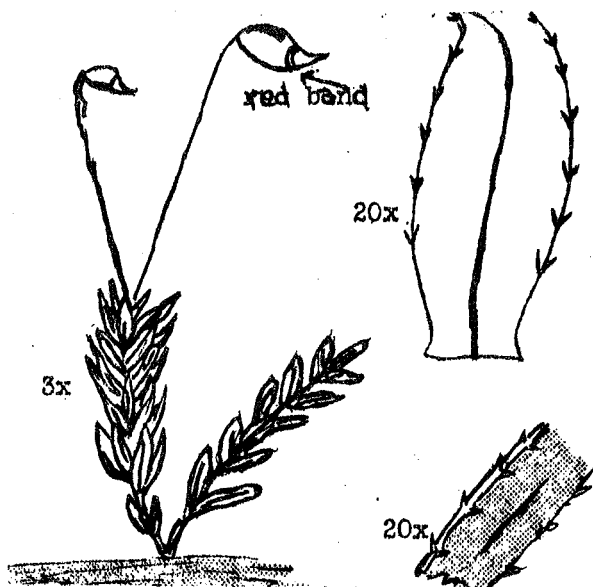
TOOTHED MNIUM

Plant shows long, slender sterile branches and middle fertile branch.

TOOTHED MNIUM (*Mnium affine ciliare*)

Found in shady banks and about the roots of trees. This moss is similar to the Woodsy Mnium but the plants are longer and more tapering and the pale, green leaves are toothed the entire length. Midrib is complete. Fruit is green in early summer, becoming yellow brown by midsummer.

3. Red-Mouthed Mnium (*Mnium spinulosum*)



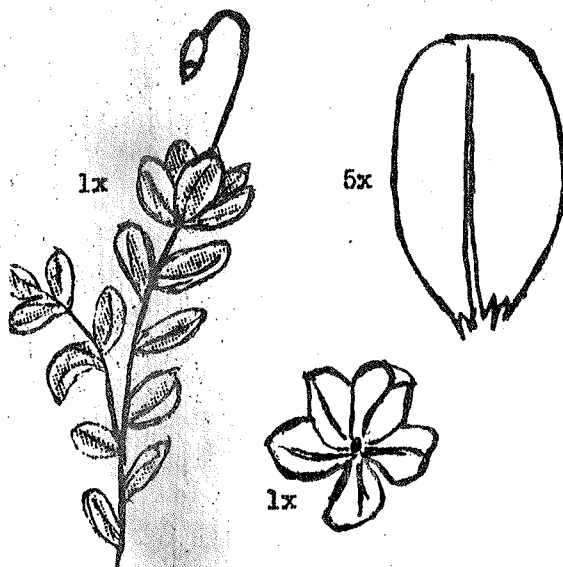
RED MOUTHED MNIUM

Plant left, with fruit. Right branch sterile. Lower right - side view of double teeth on leaf.

RED-MOUTHED MNIUM (*Mnium spinulosum*)

This moss grows in moist woods, is less common than the Woodsy Mnium, although it resembles it somewhat. On careful observation it is noticed that the leaves fold upward about the stem more commonly than in the Woodsy Mnium. Leaves are noticeably serrated with small double teeth which point out to the back and front of the leaves. (See insert in diagram.) The fruit normally grows individually out of the plant but it is not uncommon to find two or three seta. As these do not appear until June, the fruit of the Woodsy Mnium is usually well developed. The Red-Mouthed Mnium's fruit are conspicuous by the bright red band about the teeth (peristome). The rest of the capsule is a light yellowish color somewhat darkening with age.

4. Large-Leaf Mnium (*Mnium punctatum elatum*)



LARGE LEAF MNIUM

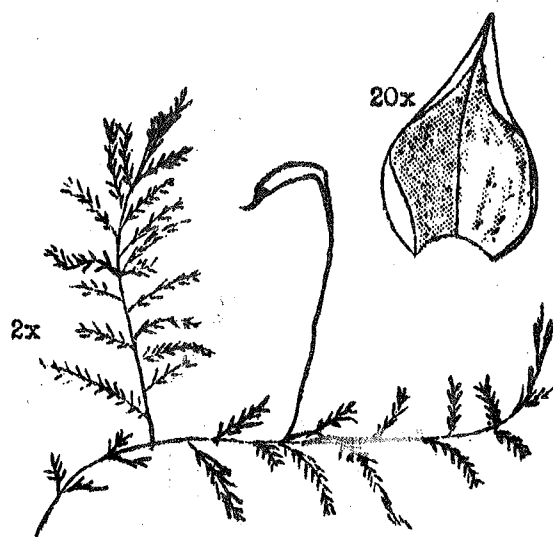
Plant left, with fruit. Lower center - top view of plant rosette.

LARGE-LEAF MNIUM (*Mnium punctatum elatum*)

This moss has large ovate leaves often growing in a rosette at the top of the plant. Plants may grow on gravel or sandy beds of streams, but are more common on rotting wood in the stream or in low moist areas nearby. Where there is sufficient sunlight, the leaves may become purple. Specimens gathered in swamps grow extremely large with leaves  $\frac{3}{8}$  of an inch in length and plants six or seven inches in height. Midrib entire length of leaf. Does not fruit too commonly, but when it does, the seta is greenish brown and the capsule is green turning brown as it ages. When dry the plants become curled like Woodsy Mnium.

B. Fern-shaped mosses with many leaved branches.

1. Common Fern Moss (*Thuidium delicatulum*)



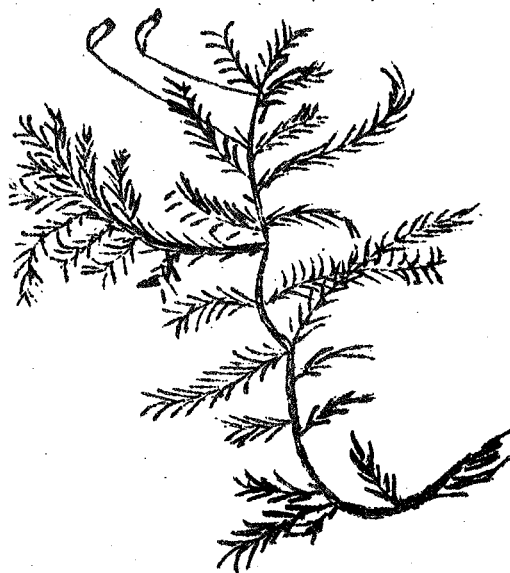
COMMON FERN MOSS

Branched plant with fruit.

COMMON FERN MOSS (*Thuidium delicatulum*)

Common in moist woods on decaying wood or among decaying plants on rocks. Lays flat, branches intermingled in a mat. Plants appear as minute little ferns. Bright green, frequently giving a ruddy or golden hue. This moss is usually pinnate (branched). Leaves are very small, straight, growing close about the stem. The fruit is not common. When present it grows from the flat laying stems upward. Both seta and capsule are reddish-brown. The operculum is long beaked and usually curves upward.

2. Mountain Fern Moss (*Hylocomium proliferum*)



MOUNTAIN FERN MOSS

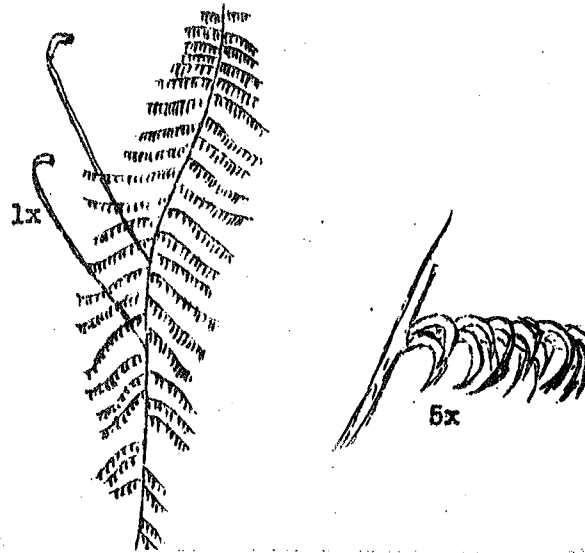
Mature plant. Note erect secondary branch rising from older, primary branch.

MOUNTAIN FERN MOSS (*Hylocomium proliferum*)

Commonly found in moist woods, on ledges and rotting logs. It is a large, fern-like moss and the plants spread out, overlapping one another. On the previous year's growth the new shoot grows upward out of the middle of the older plant, thus adding to the appearance of overlapping plants. Leaves are small, elongated and yellowish to olive green. As the fruits mature in spring, they are always on the previous year's growth. They are erect to inclined and are reddish-brown.



3. Plume Moss (*Hypnum crista-castrensis*)



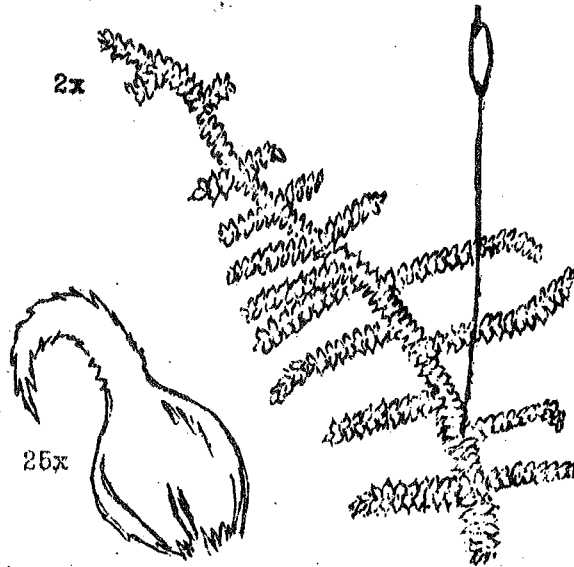
PLUME MOSS

Plant with fruit. Diagram showing downward curved leaves on branches.

PLUME MOSS (*Hypnum crista-castrensis*)

This moss is found in damp woods on decaying logs, base of trees or soil covered rocks and is shaped like a plume or feather. It may grow in tufts or individually scattered between other mosses. Its pale green color makes it stand out among commonly darker species. No moss is as closely branched as this one. The plumes stand upright or side upward instead of laying flat as most fern mosses do. Leaves are long, slender, and all curve downward toward the base of the plant. (See diagram.) Although not common, this moss fruits in the fall, displaying yellow to reddish brown capsules.

4. Pinnate Hypnum (*Hypnum imponens*)



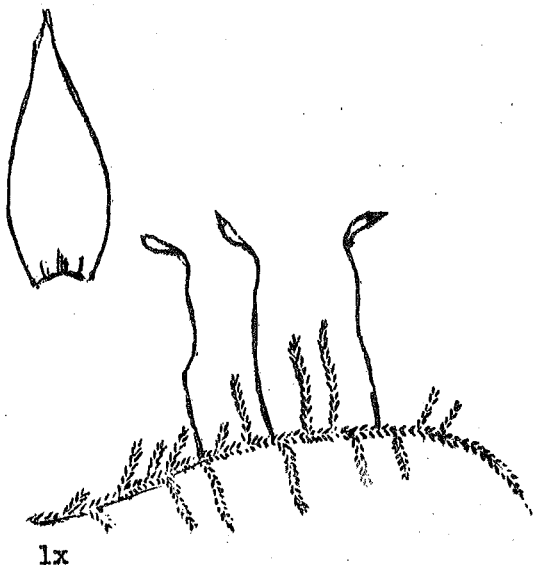
PINNATE HYPNUM  
Plant with fruit.

PINNATE HYPNUM (*Hypnum imponens*)

Almost always found on decaying wood but has been observed matting boulders in extremely moist areas. This moss is dark green and very beautiful as the branches lay at angles to the ground in such a way that the branching tips have a lighter lustre. It is much coarser and darker than the fern mosses and should not be confused with them. Fruit is uncommon. The seta grows from the middle of the stem with an erect reddish-brown capsule.

IV. Prostrate to partially erect plants with irregularly branched or incomplete fern-shaped appearance. Usually growing on soil, sometimes on rotten logs or well shaded rocks.

1. Common Hypnum (*Hypnum haldanianum*)



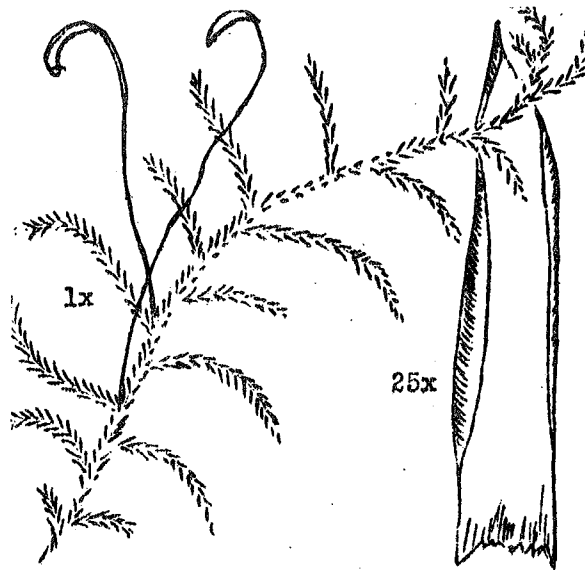
COMMON HYPNUM

On left, capsule - operculum absent.  
Present on other fruit.

COMMON HYPNUM (*Hypnum haldanianum*)

In any shady place one finds this common moss, spreading out in loose mats on rotting wood or frequently covering small rocks. It has a light, yellowish green color, often reflecting a golden tint. Plants are uneven in the manner in which they branch, following no apparent pattern of symmetry. Leaves are long, smooth and without midrib. They fold up about the stem and are very plentiful. This specie fruits very commonly in the fall with long reddish brown seta and long slender capsules of the same color. The leaves are without midribs. Capsules are cylindrical. Some are erect, others curved.

2. Shreber's Hypnum (*Calliargon schreberi*)



SCHREBER'S HYPNUM  
Plant with fruit.

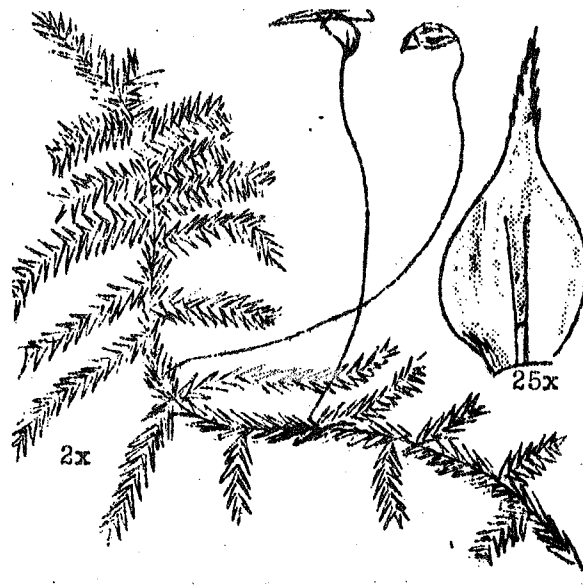
SHREBER'S HYPNUM (*Calliargon schreberi*)

Forms light green mats in woods and pastures, often 10 - 15 feet in length. As the branches of the plant curl it gives the appearance of a large hooked rug carpet. The stems are red and when lit by sunlight the carpet takes on a golden hue. Leaves are small, ovate, but curl on the sides making them appear long. Fruit is not common. Seta is long with a curved capsule and often more than one seta grows from the middle of the plant stem. Capsules are cylindrical and curved downward. Leaves have no midribs.

3. Wavy Hypnum (*Hylocomium rigosum*)

Two to four inch stems up to 1/4 inch in diameter. The leaves bend strongly to one side. The leaf midrib is only partial. Does not fruit in Maine. Common on moist cliffs and woods.

4. Shaggy Moss (*Hylocomium triquetrum*)



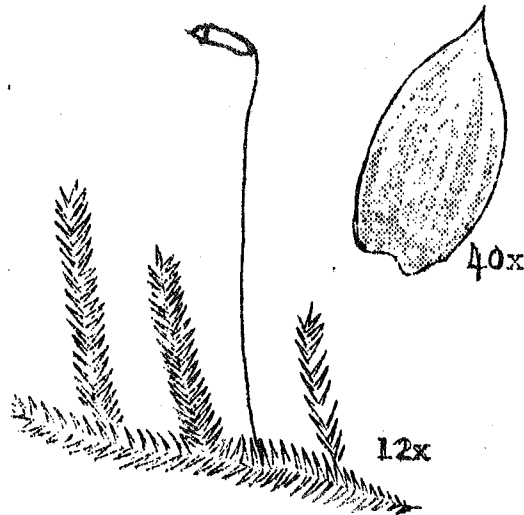
SHAGGY MOSS

Upper fruit shows veil calyptra.  
Lower capsule - older and grooved.

SHAGGY MOSS (*Hylocomium triquetrum*)

Commonly found in relatively moist soil on shaded banks near streams. It grows frequently up through a blanket of needles or leaves and is coarse and shaggy. When plentiful, it resembles a shaggy buffalo robe in the green, and is noticeable to the step. It is sometimes used in the packing of chinaware. Branches are thick and bushy varying greatly in length and arrangement. The majority of the branches curve downward. Leaves are bright green with double midrib extending part way up. Apex is slightly toothed. Capsules appear in early spring, growing out of the main stem. Calyptra appears as a veil split up one side. By midsummer this is gone and the capsule becomes regularly grooved.

5. Woodsy Plagiothecium (*Plagiothecium sylvaticum*)



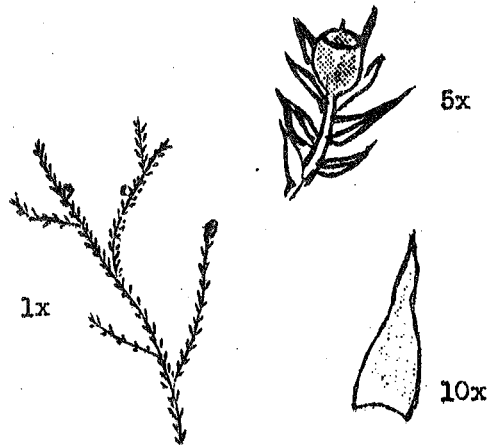
WOODSY PLAGIOTHECIUM

Plant with branches and fruit.

WOODSY PLAGIOTHECIUM (*Plagiothecium sylvaticum*)

Commonly found in moist woods, on decaying stumps; less commonly found on the ground. It forms mats of dark green to light green, depending on shade and moisture. When dry it fades to a silvery white. The branches lay prostrate, overlapping each other, as in thatching on roofs. Overall appearance is like satin cloth. Very small leaves grow in two parallel rows. No midrib is present. Capsules are not common, but when present are cylindrical, inclined and reddish-brown.

6. Common Hegwigia (*Hegwigia ciliata*)



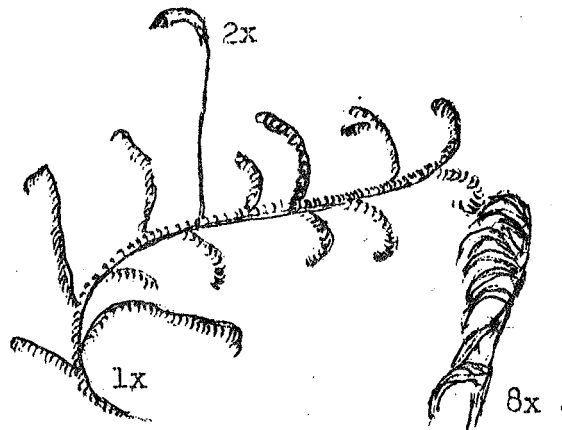
COMMON HEDWIGIA

Lower left - plant with fruit. Upper drawing - enlarged portion of same.

COMMON HEGWIGIA (*Hegwigia ciliata*)

In patches, on stonewalls, boulders and ledges that are exposed to the sun. The plants are grayish green on top and dark brown to blackish below. Leaves are small with no midrib. Capsules appear along the branches, rarely on the tips. The seta is very short. When there is sufficient moisture the stems are erect and bushy, when dry, curled and wiry. New growths are a somewhat lighter green in color. Plants frequently become three or four inches long.

7. Hooked Moss (*Hypnum unitatum*)



HOOKED MOSS

Upper left - enlarged capsule with operculum.

HOOKED MOSS (*Hypnum unitatum*)

Grows on damp stones, decaying wood or on shores of streams. This moss is light green and may lay prostrate or ascending. The branches usually hook at the tips back toward the base of the plant. The leaves are long and curved strongly to one side. Although the capsules are not common, they are cylindrical and orange at first, becoming reddish-brown by early autumn. Many confuse this moss with the true Hypnums such as Common Hypnum, Common Raphidostegium, or Creeping Hypnum, but this moss is considerably larger. True Hypnums have no midribs; strong ones are present in this species.

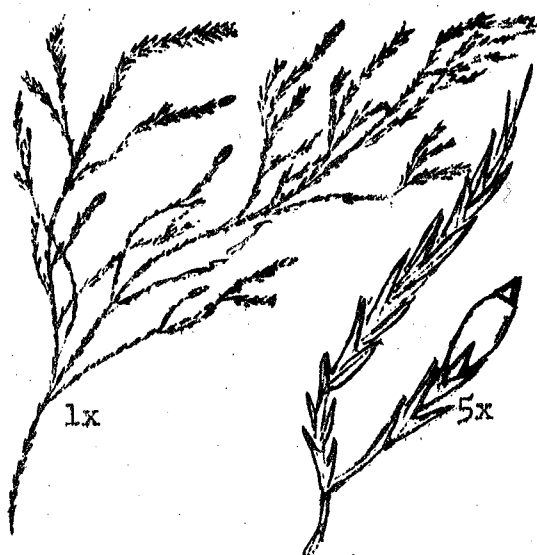


v. Mosses growing on rock or twigs submerged in streams, springs or ponds.

1. Common Dichelyma (*Dichelyma capillaceum*)

Growing on underwater branches submerged in swamps or ponds. Plants only a few inches long. They have a very stringy appearance. The leaves are recurved.

2. Common Water Moss (*Fontinalis dalecarica*)



COMMON WATER MOSS

Plant left - may be only portion of much larger branches. Enlargement at right, showing mature fruit.

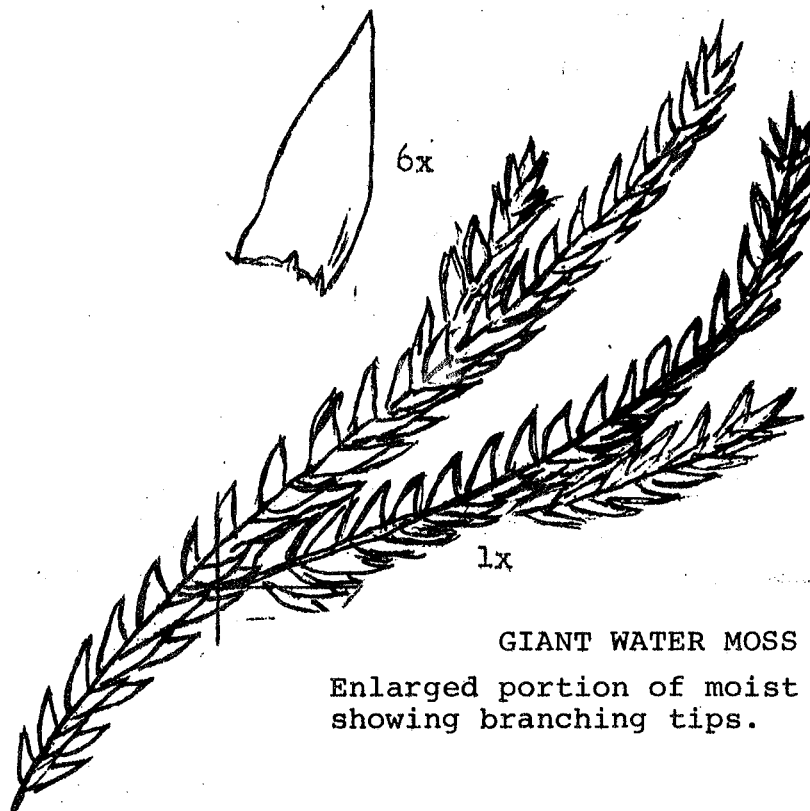
COMMON WATER MOSS (*Fontinalis dalecarica*)

Found in streams, growing attached to rocks, ledges and sticks. To the beginner the plants appear to be a stringy grass or root waving back and forth in the water. Plants are much branched. On younger portions of plants, the leaves are near the tips; older parts without leaves are stringy. Color is very dark green. Fruits commonly in midsummer. Capsules are dark green, set close in leaves on tips of shorter branches.

3. New England Water Moss (*Fontinalis nova-anglie*)

Present with common water moss. Very stringy and much longer than Common *Dichelyma* and is usually mixed in with Common Water Moss - but it does not have triangular stems. It is dark green in appearance.

4. Giant Water Moss (*Fontinalis gigantea*)



GIANT WATER MOSS (*Fontinalis gigantea*)

Growing attached to rocks, tree roots, sticks and any debris that may be in cool streams, this large moss often floats its branches on the surface and waves back and forth with the fluctuations of the current. It is usually a dark, olive green color, and may sometimes appear golden or even copper colored. Leaves are systematically arranged and give the appearance of long three-cornered branches. Stem is frequently over 1/4 inch in diameter and over a foot long. Capsules are rarely ever found.

5. Beaked Water Moss (*Eurhynchium rusciforme*)



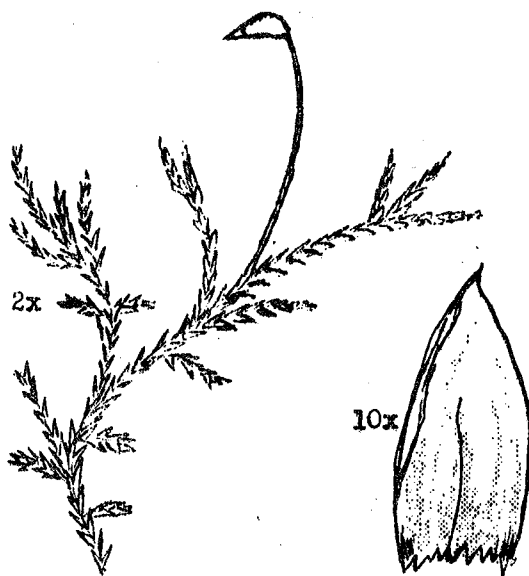
BEAKED WATER MOSS

Note long beaks on capsules.  
Diagram lower right shows  
expanded leaves.

BEAKED WATER MOSS (*Eurhynchium rusciforme*)

Commonly found on stones in stream beds when the water is cool, rapid and shady. This moss is olive and dark green above and almost black at the base. It grows flat over the rocks in a mat, frequently crowding out into the stream bed. Plants are rugged and produce many branches. Leaves are finely toothed and midrib extends about two-thirds the length. As the plant is rarely ever found out of water, the leaves are full and partially extended, giving it a robust appearance. Fruit is common in early fall; a light brown in color which stands out against the dark leaves. Capsule is elliptical with a long offset beak, thus giving the specie its name.

6. Rivulet Brachythecium (*Brachythecium rivulare*)



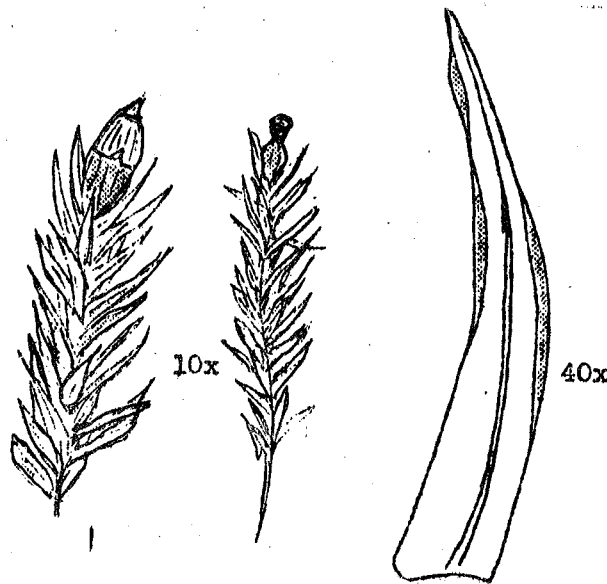
RIVULET BRACHYTHECIUM  
Plant and capsule.

RIVULET BRACHYTHECIUM (*Brachythecium rivulare*)

Found in the gravel on sides of stream beds, and in wet low areas beside rapid streams which are flooded in spring and rainy seasons. Although such areas may appear dry, there is always sufficient moisture underneath. This irregularly branched moss is a light yellow green. The small leaves are spatulate. Midrib is about two-thirds the length of the leaf. A long thick, reddish-brown seta grows out of the sides of the branches. Spores mature in the fall and are chestnut color.

VI. Mosses growing on stumps or tree trunks.

1. Common Orthotrichum (*Orthotrichum strangulatum*)



COMMON ORTHOTRICHUM

Plant left with calyptra expanded in moisture. Right plant - old and dried, calyptra absent.

COMMON ORTHOTRICHUM (*Orthotrichum strangulatum*)

Present on almost any shade tree. Plants grow erect out from the bark about one quarter inch. Beginners might confuse this group with Ulotas, but if it is in fruit, there will be little or no seta present. It fruits readily early in the summer. Leaves are deep green to dirty olive, long, lanceolate, with midrib the entire length.

2. Entodon

FLAT STEMMED ENTODON (e. cladorrhyans)

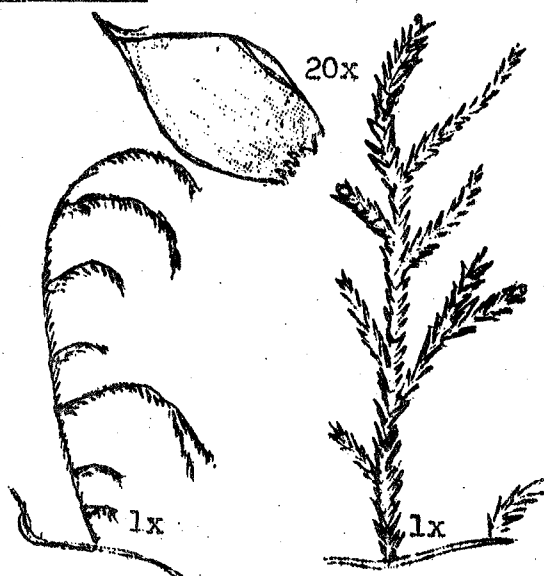
Usually on bark of old or dead hardwood trees. Leaves are spoon-shaped, glossy, yellow-green. Capsules cylindrical and erect. Much coarser than Pylarsia. Capsules have 16 teeth.

3. Leucodon

TUFTED LEUCODON (L. sciuiroides)

Usually above the four or five foot level. Appears as tufts or mats. Brownish-green at base with light green tips. Normally plants are under one inch long, considerably branched. Leaves slightly secund. Not as common as Northern Leucodon.

4. Northern Leucodon (L. brachypus)



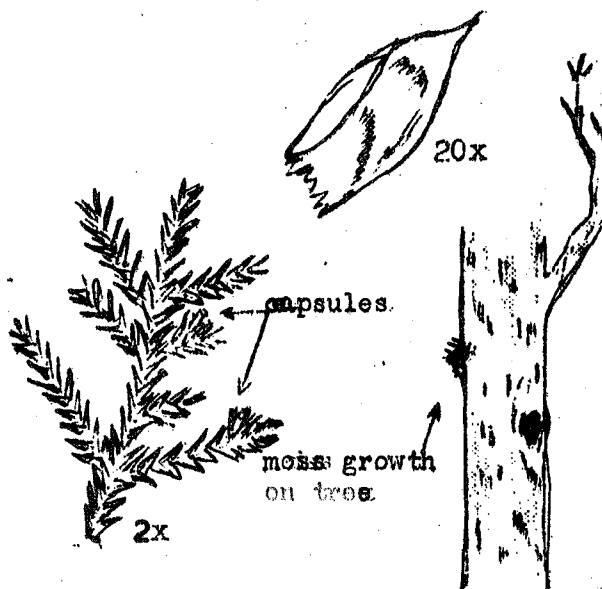
NORTHERN LEUCODON

Plant at left - dry, showing curved branches. Plant at right - moist, branches erect.

NORTHERN LEUCODON (L. brachypus)

This grows more commonly on trees than rocks, and is a shiny, olive-green drying to a brownish-green. There are primary stems nestled in the bark of trees about head high and from these grow the secondary plants. The secondary plants are erect and bushy when moist, and when dry the leaves fold about the stem. The stems curve to one side of the plant. Leaves have no teeth or midrib. The fruit is rare but when found is small and cylindrical and set in a group of leaves at the end of a branch.

5. Feathery Neckera (*Neckera pennata*)



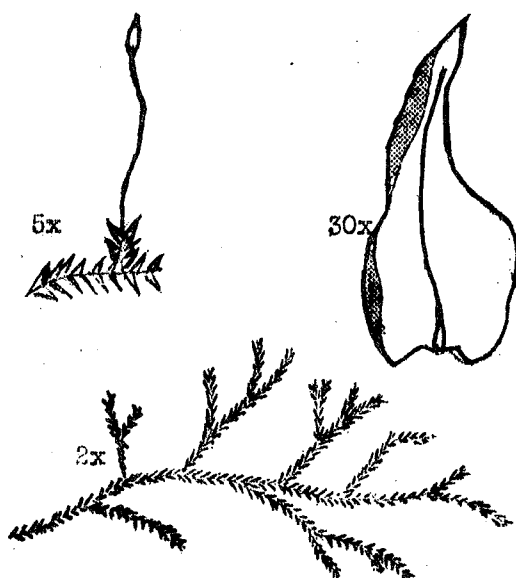
FEATHERY NECKERA

FEATHERY NECKERA (*Neckera pennata*)

This moss is common in damp, wooded areas, particularly on old, deciduous trees (i.e., elm, ash, etc.), that grow along shady streams or swampy areas. This grows in tufts. Light green and feathery in appearance, the plants grow in flat layers, one above the other out from the tree, parallel to the ground. The tufts extend from several feet above the ground up to forty or fifty feet. Capsules grow out of the older portions of moss and are present by midsummer.

Anomodons - grow in moist cool woods. These species usually cover most of the base of an older tree, appearing as a mat. All species have straight, erect, cylindrical capsules growing out of the middle portion of the plant's stem.

6. Common Anomodon (*A. apiculatus*)  
Tongue shaped leaves. Commonly so matted few branches occur above the matted stems.
7. Slender Anomodon (*A. attenuatus*)



#### SLENDER ANOMODON

Upper left - fruit growing from prostrate branch. Lower figure - mature plant.

#### SLENDER ANOMODON (*A. attenuatus*)

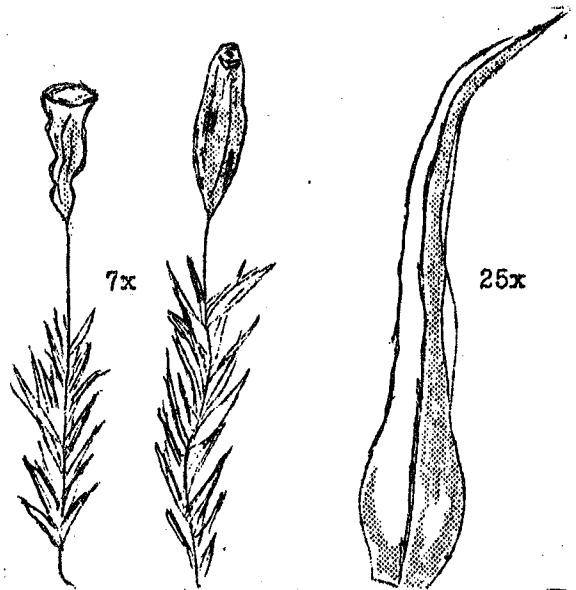
This moss usually grows at the base of trees up to a height of three or four feet in cool, moist, woods. It is less commonly found on rocks. The mat formed is seldom of this specie alone but usually consists of other anomodons and some liverworts. This moss is very deep, olive-green becoming brown with age. It is much branched with minute leaves and the branches taper to very fine points. When moist, the leaves are wide-spreading, but fold along the stems when dry. It is not common moss to fruits and rarely does so in the fall. Fruit is red-brown and rises from a branch.



8. Velvet Anomodon (*A. rostratus*)

Bright yellow-green color on top of brown basal leaves. Common on trees growing in swamps or moist woods. The overall appearance is velvety.

9. Crisped Ulota (*Ulota crispa*)



CRISPED ULOTA

Plant at left is dry - calyptra is absent.  
Right - calyptra present - more moist habitat.

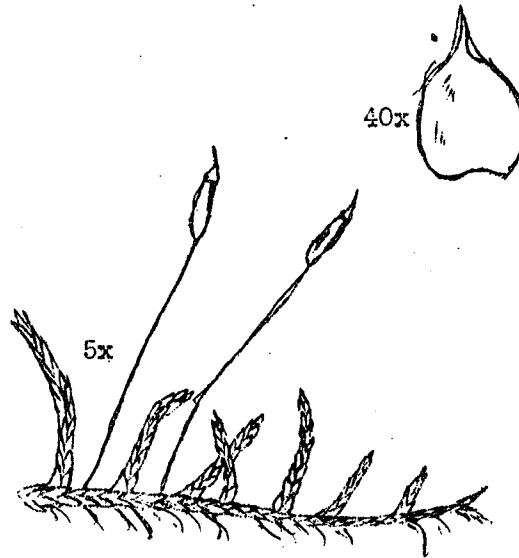
CRISPED ULOTA (*Ulota crispa*)

Appears high up on the trunks and branches of beech, maple, elm, birch and fir trees. Grows in little tufts or mats of deep green. It fruits readily and in midsummer the capsules are full and smooth, but by late summer they wrinkle and shrink considerably. Leaves are long, lanceolate with midrib the entire length. When moist they leaves extend straight from the stem, but usually the plants are dry and leaves appear kinky.

10. Puckered Ulota (*Ulota ludwigii*)

Has a pear-shaped capsule with wrinkled short ridges which extend only a short distance from the capsule's mouth.

11. Common Thelia (*Thelia hirtella*)



COMMON THELIA

Mature capsules with long beaks rising from prostrate plant. Note rhizoids on underside of plant.

COMMON THELIA (*Thelia hirtella*)

Found at the base of trees and on stumps in close mats. Grayish-green in color. When the individual plant is examined, there is found to be a primary stem that grows close to the bark and from this are several upright branches. The plants adhere to the bark by very small branch-like stems (rhizoids). Leaves are very small, spatulate, growing closely folded about the stem. Although not common, fruits mature in the fall. They are erect, cylindrical, yellowish-brown.



