

V

JULY, 1859

(ÆT. 41-42)

July 1. P. M. — To Second Division Brook.

Have heard the peculiar peep of young tailless golden robins for a day or more.

White water ranunculus in full bloom at least a week, in Second Division Brook, near the dam, in the shade of the bank, a clear day. Its leaves and stems waving in the brook are interesting, — much cut and green.

The *Holcus lanatus*, past prime, near J. P. Brown's little meadow beyond end of his moraine; also grows near southwest end of Hubbard's Grove. *Agrostis*, either *vulgaris* or *alba* (or both), now generally coming into bloom in fields both moist and dry, but I should say with considerable ligules and rather roughish sheaths.

July 2. P. M. — To Stow's chestnut and *Thaspium aurum*.

Vetch, morning-glory, *Andromeda ligustrina*, how long?

Waded out thirteen rods from rock in Flint's Pond, and was only up to my middle.

Mitchella repens is abundantly out. *Pyrola elliptica* out. *Cladium* not quite.

July 3. P. M. — To Hubbard's Grove.

1859]

LEAPING FROGS

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You see in rich moist mowing the yet slender, recurving unexpanded panicles or heads of the red-top (?), mixed with the upright, rigid herd's-grass. Much of it is out in dry places. *Glyceria fluitans* is very abundant in Depot Field Brook. *Hypericum ellipticum* out.

I noticed the other day, I think the 30th, a large patch of *Agrostis scabra* in E. Hosmer's meadow, — the firmer ridges, — a very interesting purple with its fine waving top, mixed with blue-eyed grass.

The *Mitchella repens*, so abundant now in the north-west part of Hubbard's Grove, emits a strong astringent cherry-like scent as I walk over it, now that it is so abundantly in bloom, which is agreeable to me, — spotting the ground with its downy-looking white flowers.

Eleocharis obtusa and *acicularis* are now apparently in prime at water's edge by Hubbard's Grove bridge path. Also *Juncus bufonius* is very abundant in path there, fresh quite, though some shows seed. *Juncus tenuis*, though quite fresh, is also as much gone to seed.

July 4. June 28th, I observed up the Assabet some exceedingly handsome amelanchier leaves, bright-crimson, regularly striped with green on the veins and with scattered yellow spots. The shrub probably dying. *Vide* some in press.

P. M. — To Fair Haven Pond, measuring depth of river.

As you walk beside a ditch or brook, you see the frogs which you alarm launching themselves from a considerable distance into the brook. They spring considerably upward, so as to clear all intervening obstacles,

and seem to know pretty well where the brook is. Yet no doubt they often strike, to their chagrin and perhaps sorrow, on a pebbly shore or rock. Their noses must be peculiarly organized to resist accidents of this kind, and allow them to cast themselves thus heedlessly into the air, trusting to fall into the water, for they come down nose foremost. A frog reckons that he knows where the brook is. I shudder for them when I see their soft, unshielded proboscis falling thus heedlessly on whatever may be beneath.

I observe at Well Meadow Head that the fall has already come conspicuously to the hellebore, and they are mostly turned yellow, while their large green seed-vesicles are ripening; but the skunk-cabbage is still green.

The front-rank polygonum, having been submerged by the unusually high water of the last fortnight, is a conspicuous red or purple color; and this is evidently the effect of the water alone, as, I think, it is the water which turns the early maples.¹ All the river's edge is now tinged with this purplish streak, yet they are healthy-looking leaves.

Johnswort is just fairly begun. *Hypericum ellipticum* and Jersey tea first observed.

The deepest place I find in the river to-day is off Bittern Cliff, answering to the bold shore. There is an uninterrupted deep and wide reach of the river from Fair Haven Pond to Nut Meadow Brook.

July 5. P. M. — To Ball's Hill, sounding river.

¹ Both white and red, when the leaves are not half developed, long ago.

Having sounded the river yesterday and to-day from entrance to Fair Haven Pond to oak at Ball's Hill, the water being to-day three inches lower than yesterday, — or now a foot and a quarter above what I call summer level, — I make these observations:¹ —

Calling any place above Ball's Hill where the water is eleven feet deep or more at summer level a deep hole, I find six such deep holes within the above limits, viz. : 1st, under the steep hill at southwest part of Fair Haven Pond; 2d, at Bittern Cliff; 3d, four rods below French's Rock, or opposite mouth of Bill Brook; 4th, deep hole at ash; 5th, deep hole at sharp bend; 6th, deep hole at northeast angle of the Holt. In the order of depth they stand thus: —

| | |
|----------------------------|----------|
| 1. Purple Utricularia Bay | 19½ feet |
| 2. Sharp bend by Holt | 17 |
| 3. Northeast angle of Holt | 16½ |
| 4. French's Rock | 12½ |
| 5. Bittern Cliff | 11 |
| 6. Deep hole by ash | 11 |

These "holes" appear to be of two kinds. In two, if not three, of the above instances they appear to be a trace of the original formation of the river valley, and to be independent of the river and not necessarily at an

¹ [From now till the middle of August Thoreau devoted much of his time to a study of the physiography of Concord River, and the Journal contains many tables of statistics concerning its depth, its rise and fall, its meanders, the rapidity of its current, and the like. Such details could be of no interest to the general reader, and the editors are assured on expert authority that they are now without scientific value. Most of them are therefore omitted, enough being retained to show something of the method of the work and the painstaking spirit in which it was carried on.]

angle. No. 1 is evidently traceable to a very steep and high hill half a dozen rods off, and No. 5 to a small rocky cliff some three rods off. There is a part of the bare, precipitous cliff under water at lowest level. No. 4 appears to be of a similar character with the last.

The others (or 2, 3, and 6) are of a different character, — where there is meadow on each side and they are not betrayed by any elevation of the shore. In each case they are close to the positive side at an angle in the river. The deepest (and also the deepest of any in the river proper), which will serve for a sample, is at the sharpest bend in the river in Concord, and, I think, at the narrowest part of the river in the town. The stream, not deep and rather more than ordinarily swift above, here strikes square (or worse [?]) against the easterly bank (which is only some three feet above summer level), and has eaten out a channel to that depth, so near the bank (some twelve feet) that you could jump from the bank into the deepest place in the river proper in the town. Thence it shoals regularly to the opposite shore. The bottom exactly in the deepest holes of this last description is not muddy but sandy. In each of these three instances there is a muddy, stagnant expansion on the opposite side just below (or else about opposite), betraying a reaction to this force. There is also a low meadow or point on the opposite side where the river has flowed at a comparatively recent period. The river is not particularly swift at these places.

Calling all places which are four or less feet deep at summer level shallows, there are at least seven such between Fair Haven Pond and Ball's Hill.

Potamogetons begin to prevail below four and a half [feet] (five and a half in sluggish water), and reach quite across the river at three feet. They invariably occupy these shoals, except the one below ash tree with a bottom of shifting sand, though they are densest on broad sand-bars occupying the midstream, on which there is one to two and a half or three feet [of] water and a clearer channel on one or both sides or in the middle.

With one exception (*i. e.* Barrett's Bar) these shoals are just below (?) considerable bends. Also the river is generally narrower than the average at the shoals.

The river (in Concord) is much more variable in depth below the junction of the two rivers than above it.

The great bends in Concord above Ball's Hill are about nine. The only remarkable, or Great, Bend in Concord is the Holt, where a new channel might be cut, saving nearly two thirds the distance.

All these bends in C. (except perhaps the Holt in part (?)) are occasioned by the river striking firmer land or a hill or cliff and being turned by it. It is like the wriggling of a snake controlled between two fences. It is not so with the Sudbury Meadow bends.

From a rude estimate I should say about one mile, or say one eighth (?) part the river in Concord, is weedy.

There is a peculiarly long, sluggish, wide, deep, and lake-like reach, muddy in the broadest parts (for Concord), from Fair Haven Pond to Nut Meadow Brook. Though in meadows, it is pretty straight. Not enough current to make a meander.

Many a farmer living near the river will tell you of some deep hole which he thinks the deepest in all the

river, and which he says has never been sounded (which may have been true, and hence its reputation), where he has chanced to fish, or possibly bathed, or somebody has been drowned. It only need to be considerably over his head to acquire this reputation. If you tell him you have sounded it, and it was not very deep, he will think that you did not find the right spot.

The deep places in the river are not so obvious as the shallow ones and can only be found by carefully probing it. So perhaps it is with human nature.

Fair Haven Pond, though not very deep generally, is a kind of deep hole, to be referred to Fair Haven and Lee's Cliff, etc.

The deepest part of the river is generally rather toward one side, especially where the stream is energetic. On a curve it is generally deepest on the inside bank, and the bank most upright.

Those deep holes in the Great Meadows are somewhat like trout-holes under the bank in Second Division Brook.

The principal weedy place for length (in Concord) is from boat's place to oak; for density, shallowness, and length, all together, is Barrett's Bar.

The swifter places *that I remember*, between Fair Haven Pond and Ball's Hill, *leaving out bridges*,¹ are:—

Clamshell
Hubbard's Bath
Merrick's
Island shoal, etc.

¹ Aug. 4th. I do not remember any of consequence above except amid weeds at Rice's Bend.

French Rock, etc., the shoal below
Rocks below Old North Bridge
Barrett's Bar
Sharp Bend Reach
Holt's Ford

That is, generally the shoal and weedy places, but also where the obstruction is a sharp bend or rocks.

July 6. My English cress (*Nasturtium officinale*) at Depot Field Brook is in bloom, and has already begun to go to seed, turning purplish, as it withers (from white).

P. M. — To Lee's Cliff.

The fields are now purplish with the anthers of the herd's-grass, which is apparently at its height.

Grass now for a week or more has been seriously in the way of the walker, but already I take advantage of the few fields that are mowed. It requires skillful tacking, a good deal of observation, and experience to get across the country now.

At Lee's Cliff, pellitory apparently not long, yet I see small green fruit. The gymnostichum grass just begun.

The heart-leaf flower is now very conspicuous and pretty (3 P. M.) in that pool westerly of the old Conan-tum house. Its little white five-petalled flower, about the size of a five-cent-piece, looks like a little white lily. Its perfectly heart-shaped floating leaf, an inch or more long, is the smallest kind of pad. There is a single pad to each slender stem (which is from one to several feet long in proportion to the depth of the water), and these padlets cover sometimes, like an imbrication, the whole

surface of a pool. Close under each leaf or pad is concealed an umbel of ten to fifteen flower-buds of various ages, and of these one at a time (and sometimes more) curls upward between the lobes of the base, and expands its corolla to the light and air about half an inch above the water, and so on successively till all have flowered. Over the whole surface of the shallow pool you see thus each little pad with its pretty lily between its lobes, turned toward the sun. It is simply leaf and flower.

Galium pilosum, how long?

July 7. P. M. — To Great Meadows.

P. Hutchinson says he once found a wood duck's nest in a hollow maple by Heywood's meadow (now by railroad), and tried to get the young as soon as hatched, but they were gone too soon for him.

On the first, or westerly, part of the Great Meadows, *i. e.* the firmer parts and the bank, I find, mixed with sedges of different kinds, much red-top (coloring the surface extensively), fowl-meadow (just begun to bloom and of a purplish lead-color, taller than the red-top), the slender purple-spiked panic, *Agrostis (perennans ? or scabra ? ?)*. In the wet, or main, part, beside various other sedges, — as [*Carex*] *stellulata*, *lanuginosa*, *stricta*, etc., etc., — wool-grass, now in flower, a sedge (apparently *C. ampullacea* var. *utriculata* toward Holbrook's) thicker-culmed than wool-grass, but softer and not round, with fertile spikes often three inches long, and slender. A great part of the meadow is covered with, I think, either this or wood grass (not in flower). I am not

certain which prevails, but I think wool-grass, which does not flower. Also, mixed with these and lower, *dulichium*, *Eleocharis palustris*, etc., etc.¹

First notice *pontederia* out; also *tephrosia*, how long?

The note of the bobolink has begun to sound rare?

Do not young nighthawks run pretty soon after being hatched? I hear of their being gone very soon.

Batling at Barrett's Bay, I find it to be composed in good part of sawdust, mixed with sand. There is a narrow channel on each side, deepest on the south. The *potamogeton* is eight feet long there in eighteen inches of water.

I learn from measuring on Baldwin's second map that the river (*i. e.* speaking of that part below Framingham) is much the straightest in the lower part of its course, or from Ball's Hill to the Dam.

It winds most in the broad meadows. The greatest meander is in the Sudbury meadows.

From upper end of Sudbury Canal to Sherman's Bridge direct is 558 rods (1 mile 238 rods); by thread of river, 1000 rods (3 miles 40 rods), or nearly twice as far.

But, though meandering, it is straighter in its general course than would be believed. These nearly twenty-three miles in length (or 16 + direct) are contained within a breadth of two miles twenty-six rods; *i. e.*, so much it takes to meander in. It can be plotted by the scale of one thousand feet to an inch on a sheet of paper seven feet one and one quarter inches long by eleven inches wide.

¹ *Vide* back, June 16th.

The deep and lake-like are the straightest reaches. The straightest reach within these limits above Ball's Hill is from Fair Haven Pond to Clamshell Hill.

I observed in Maine that the dam at the outlet of Chesuncook Lake, some twenty miles off, had raised the water so as to kill the larches on the Umbazookskus extensively. They were at least four or five miles up the Umbazookskus.

July 8. Friday. I see an emperor moth (*Attacus Cecropia*), which came out the 6th.

P. M. — To Clamshell by river.

The *Carex Muhlenbergii* is common on Clamshell slope, just beyond the ravine.

Thimble-berries have begun.

The islands of the river, below the Assabet especially, — as Hosmer's, and the one just below French's Rock, — are now covered with canary grass, which has almost entirely done and closed up; fowl-meadow (*Poa serotina*), now fairly begun to bloom (first noticed the middle of June its slender green panicles shaped like a green red-top); *Glyceria fluitans*, going out of bloom; also the sensitive fern (the "hand leaf" of haymakers); pipes; (and sedges, which might be named as soon as any, as the *crinita* which overhangs the water).

I judge that in a freshet the water rises higher as you go down the river, both from the height to which it rose last March, as shown me at several bridges, and from the height of the bridges themselves, which the builders have been gradually compelled to raise, for the most part just above high-water mark.

July 9. Paddle up river and sound a little above Fair Haven Pond.

See young kingbirds which have lately flown perched in a family on the willows, — the airy bird, lively, twittering.

The water having gone down, I notice a broad red base to the bayonet rush, apparently the effect of the water, even as the maples (of both kinds) and the polygonums are reddened. The bayonet rush is not quite out.

I see, at length, where the floated meadow (on Hubbard's meadow) came from last spring, — from opposite Bittern Cliff, and some below. There is a pond created in the meadow there, some five rods by four and three to three and a half feet deep, water being eleven and a half inches above summer level, — a regular oval pond, where nothing rises above water, but I see pontederia grass-like leaflets springing up all over the bottom. The piece taken out here probably contained no button-bushes. So much of the meadow which has been moved [?] is thus converted into a pool. Close by, south, are still larger scars, where masses of button-bush thicket have been ripped up. No doubt some of those on Hubbard's meadow came from here. The water where they stood is about the same depth as in the other place. I see a piece of floated button-bush on the south side of Fair Haven Pond, west of the old boat place of Baker Shore, which is twelve rods long by one rod wide, and, in two or three pieces [*sic*] where it is several thick-nesses, it is full three feet thick of solid earth. The whole is set in a straight line separating the meadow in the rear

from the pond, forming, in fact, just such a brink there as exists in perfection on the west side of the pond. This might be called brink-bush, or drift-bush, river-fence. It is the floating fencing-stuff of the river. Possibly that (in the spring) island south of the mouth of Well Meadow Brook, and even the large island in the pond, had its beginning thus, not only willows but maples and alders having at length sprung up on it and built it up.

The next day (10th) I see, just above Sherman's Bridge, on the east side, a piece, some eight rods long by one rod wide, arranged as a brink separating a meadow from the river in the same manner, and, a quarter of a mile higher up on the same side, a more or less broken piece which I estimated by my eye to be five rods by twelve, the largest mass or collection of the kind moved together that I ever saw. I have seen six pieces moved last March, or spring, which contained all together more than half an acre. There was more than a quarter of an acre in the last piece alone.

The button-bush and black willow generally grow together, especially on the brink of the stagnant parts of the river. (Very little comparatively in the great Sudbury meadow and in our Great Meadows.) Perhaps they are there carried off by the ice. They stand generally in line (sometimes half a dozen rods wide) on the brink of the river, separating it from some (commonly narrow) meadow behind, and at high water are a distinct line of separation, rising above the surface and indicating the summer boundary. The best example is at Fair Haven Pond, west side. It is often pretty deep water quite up to the bushes, or there are pads, etc., out-

side them. There they stand in massive and regular straight or curving lines, and you suppose that they have stood there for ages. But I have seen twelve rods together (*i. e.* in one piece) of such fence, the whole width of it transplanted half a mile to some shore where there was none, and forming a fence to the pond or river there. We are accustomed to refer changes in the shore and the channel to the very gradual influence of the current washing away and depositing matter which was held in suspension, but certainly in many parts of our river the ice which moves these masses of bushes and meadow is a much more important agent. It will alter the map of the river in one year. The whole shore for forty rods on the east side below Bittern Cliff was stripped of its button-bushes and willows, etc., etc., last spring, and as I floated over the river there to-day, I could not at first account for the remarkable breadth of the river there, like a bay. I got a very novel impression of the size of the river, though it is now low water. In fact the width of the river has been increased fully three or four rods for more than forty rods in length, and is three to four feet deep on that side now. You cannot tell, of any clump or row of button-bushes, whether it grew up where it stands or was thus set out there. I have seen these masses, sunk in midstream, produce a small weedy spot the same year, and possibly a large mass might thus form an extensive shallow and weedy place or island.

Potamogetons begin to prevail at five and a half feet in sluggish water (at summer level), though they will still be visible when the water rises higher, rising with it. They appear at four and a half, if more rapid, and

are densest at three feet, if the stream is not exceedingly rapid.

The kalmiana lily grows to seven and a half feet (summer level) where it is sluggish (and is still atop when it is a foot or two deeper), and you see this, the heart-leaf, utricularia, and potamogeton, all together, in five feet [of] water (also in same place when a foot or two higher). The front-rank polygonum grows outside the pontederia, next to the potamogeton, and, near the causeway bridge, in Wayland, reaches (except four or five feet) quite across the river (three feet [of] water).

We have not only the Assabet uniting with the main stream about in the middle of the township, but three highways thus raying out in different directions, — as great an amount of river within these limits as could well be. Neither stream runs direct through the town. The main stream runs first northerly or northwesterly and then northeasterly, and perhaps this is as convenient for sailing in flat-bottomed boats as any arrangement could be, the prevailing winds being northwest and southwest, but sailing is much affected by hills, woods, etc.

To-day, July 9th, water is eleven and a half inches above summer level.

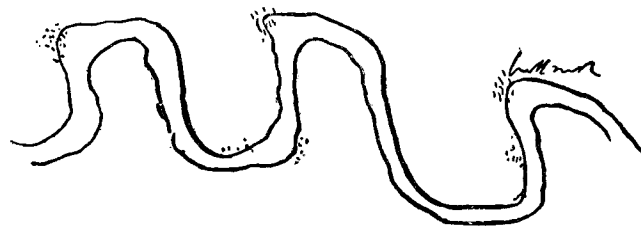
July 10. Water ten and a half inches above summer level.

8 A. M. — Take boat at Fair Haven Pond and paddle up to Sudbury Causeway, sounding the river.

To-day, like yesterday, is very hot, with a blue haze concealing the mountains and hills, looking like hot dust in the air.

Hearing a noise, I look up and see a pigeon woodpecker pursued by a kingbird, and the former utters loud shrieks with fear.

Paddling through the wild Sudbury meadows, I am struck with the regularity with which the phalanxes of bulrushes (*Scirpus lacustris*) occur. They do not grow in a continuous line, like pipes or pontederia, but in small isolated patches. At each bend, though it does not appear on Baldwin's map, there is a bay-like expansion of the river, now half emerged, thus: —



where the more stagnant water has deposited mud, and in each such place, with remarkable regularity, a phalanx of bulrushes presents itself as you ascend. It occasionally occupies a corresponding place as you descend, and also intermediate shores of a similar character. Yet it so constantly occurs in just this position as to be remarkable. It is not very common along our river, being mainly confined to the larger and wilder meadows, — at any rate to the expansions, be they larger or smaller. These phalanxes are from one to three or more rods wide, and the rush is of a glaucous green, very interesting with its shafts slanting different ways. At one bend,

especially, grows — and I have not noticed it elsewhere except in this meadow — the great *Scirpus fluviatilis* (how long out?). Yet the leaves are not so roughish nor so long as described.

The *Arundo Phragmites* is not nearly out, though quite tall. *Spartina cynosuroides* well out. The green pipes border the stream for long distances.


The high water of the last month has left a whitish scum on the grass.

We scare up eight or a dozen wood ducks, already about grown. The meadow is quite alive with them.

What was that peculiar loud note from some invisible water-fowl near the Concord line? Any kind of plover? or clapper rail?

H. Buttrick says he has shot a meadow-hen much larger than the small one here. I hear in the ridge the peculiar notes of, I think, the meadow-hen, — same *e. g.* [*sic*] where I got an egg and nest. The young are probably running there. Often hear it in the great Sudbury meadow.

See many young birds now, — blackbirds, swallows, kingbirds, etc., in the air. Even hear one *link* from a bobolink.

I notice at Bittern Cliff that the sparganium floats upstream,  probably because the wind has blown thus.

The bottom of Fair Haven Pond is very muddy. I can generally thrust a pole down three feet into it, and it may be very much deeper.

Young pouts are an inch long, and in some ditches left high and dry and dead with the old.

July 11. Another hot day with blue haze, and the sun sets red, threatening still hotter weather, and the very moon looks through a somewhat reddish air at first.

The position of the button-bushes determines the width of the river, no less than the width or depth of the water determines the position of the button-bushes. We call that all river between the button-bushes, though sometimes they may have landed or sprung up in a regular brink fashion three or four rods further from, or nearer to, the channel.

That mass (described on the 9th, seen the 10th) in the Wayland meadows above Sherman's Bridge was, I think, the largest mass drifted or growing at all on that great meadow. So this transplantation is not on an insignificant scale when compared with [the] whole body that grows by our river. The largest single mass on the Wayland meadows, considering both length and breadth, was the recently drifted one. To-day the farmer owns a meadow slightly inclined toward the river and generally (*i. e.* taking the year together) more or less inundated on that side. To-morrow it is a meadow quite cut off from the river by a fence of button-bush and black willow, a rod or more in width and four to seven or eight feet high, set along the inundated side and concealing the river from sight.

I hear that Mr. and Mrs. Such-a-one are "going to the beach" for six weeks. What a failure and defeat this suggests their lives to be! Here they live, perchance, the rest of the year, trying to do as they would be done by and to exercise charity of all kinds, and now at last, the parents not having realized their aspirations in the

married state, and the misses now begun to be old maids without having found any match at all, succumb and slope to the beach for six weeks. Yet, so far from being felt to be a proof of failure in the lives of these Christians, it is thought to be the culminating-point of their activity. At length their season of activity is arrived, and they go to the beach, they energetically keep cool. They bathe daily and are blown on by the sea-breeze. This keeps their courage up for the labors of the year. This recess which the Sabbath-school teachers take! What if they were to abide, instead, with the caravan of sweltering pilgrims making their way over this Sahara to their Mecca?

We hear at length that Miss Such-a-one, now well advanced in years, has at length shut up house and gone to the beach. Man servant and maid servant went long ago to prepare the way for her, — to get the bottles of all kinds ready. She has fought the good fight here until at length no shield nor pretense will serve, and now she has gone to the beach, and have not her principles gone with her? She has flitted to Swallow Cave, where, perchance, no duties lurk.

Ah, shall we not go to the beach after another fashion some of us one day? Think of the numbers who are imbeached by this time! How they flutter like devil's-needles and butterflies commingled along our pontederia'd shores!

They have gone and left an empty house. The silver is cached, as prairie travellers leave behind provisions which they expect to return to. But the rent of the last house goes on nevertheless, and is to be added to the

board at the great watering-place. So is it with every domicile we rent; the rent never ceases, but enlarges from year to year. They have gone to the beach to get a few pebbles, which help digestion for the rest of the year.

July 12. Another hot day. 96° at mid-afternoon.

P. M. — To Assabet Bath.

The elm avenue above the Wheeler farm is one of the hottest places in the town; the heat is reflected from the dusty road. The grass by the roadside begins to have a dry, hot, dusty look. The melted ice is running almost in a stream from the countryman's covered wagon, containing butter, which is to be conveyed hard to Boston market. He stands on the wheel to relieve his horses at each shelf in the ascent of Colburn Hill.

I think I have distinguished our eriophorums now. There is the *E. vaginatum*, the earliest, out long ago; the *E. polystachyon*, well out June 19th; and to-day I see the *E. gracile*, which apparently has not been out quite so long as the last. Its leaves are channelled triangular. Saw yesterday the *E. Virginicum*, apparently in bloom, though very little woolly or reddish as yet, — a dense head.

The taller dark rhynchospora is well out.

In the evening, the moon being about full, I paddle up the river to see the moonlight and hear the bullfrogs. The toads and the pebbly *dont dont* are most common. There are fireworks in the village, — rockets, blue lights, etc. I am so far off that I do not hear the rush of the

rocket till it has reached its highest point, so that it seems to be produced there. So the villagers entertain themselves this warm evening. Such are the [ir]aspirations.

I see at 9.30 P. M. a little brood of four or five barn swallows, which have quite recently left the nest, perched close together for the night on a dead willow twig in the shade of the tree, about four feet above the water. Their tails not yet much grown. When I passed up, the old bird twittered about them in alarm. I now float within four feet, and they do not move or give sign of awaking. I could take them all off with my hand. They have been hatched in the nearest barn or elsewhere, and have been led at once to roost here, for coolness and security. There is no cooler nor safer place for them. I observe that they take their broods to the telegraph-wire for an aerial perch, where they teach them to fly. They have gone to their beach.

July 14. P. M. — Sounded river from Ball's Hill (*i. e.* off Squaw [?] Harbor) to Atkins's boat-house corner.

The river, in all the above distance, nowhere washes the base of an isolated (*i. e.* to except long, lowish hill-banks like Clamshell, etc.) steep hill, without a greater depth off it.

The average depth between Sudbury Causeway and Atkins's boat-house bend at wall, or for fifteen miles two hundred and eighty-two rods, is eight and one eighth feet.

There extends from Tarbell Hill to Skelton Bend what I will call the Straight Reach, a mile and a third

long and quite straight. This is the finest *water* view, making the greatest impression of size, of any that I know on the river. It is very broad, deep, and clear of weeds. Average depth 11+ feet (and at highest water some 19 feet). The bottom is almost everywhere muddy. No weeds in the middle. Measuring on the plan by Baldwin, it is three to four hundred feet wide. The depth is also very uniform, varying but little (in the thread) from the average 11+ (except a deep hole and channel at the commencement off Tarbell Hill).

Yesterday (the 13th) Frank Adams brought me a bird's nest and egg from an apple tree near the road by Addison Fay's house. He says it was about twelve feet high in the tree, and it appears to have been in a fork. The nest is most like a kingbird's, or a stout, thick cherry-bird's, or even a very thick tanager's, or a purple finch's half as large again as usual. The egg is the size and form of the phoebe's, but blue-white. The nest is three inches high and five inches wide outside, two inches deep and two and a half wide inside; composed of coarse stubble, strings, coarse root-fibre, etc., externally, and neatly lined with fine withered grass. The egg is pale blue-white, four tenths of an inch long by three tenths wide at the larger end, being broad at one end like a phoebe's. Can it be a cherry-bird's without spots and of the form described by Wilson?

He also has a very large cuckoo's egg, which again makes me suspect that we have the yellow-billed cuckoo.

July 15. P. M. — To Ledum Swamp.

First notice Canada thistle, *Aralia hispida*, *Stachys aspera*, and *Asclepias pulchra*. The *Eriophorum vaginatum* done. The white orchis not yet, apparently, for a week or more. Hairy huckleberry still in bloom, but chiefly done.

Gather a few *Vaccinium Pennsylvanicum*. Raspberries, in one swamp, are quite abundant and apparently at their height.

July 16 and 18. Afternoons, I sounded the Assabet as far up as the stone bridge.

This bridge, as I see by the town records, was talked about (*i. e.* the building) in 1807, and was probably built that year or the next (though E. Wood says that the Turnpike Company, who then proposed to build it, did not fulfill their contract). Shattuck's date, 1802, is wrong. Accordingly, by building this narrow bridge here, twenty-five feet in width, or contracting the stream to about one fourth its average width, the current has been so increased as to wash away about a quarter of an acre of land which rises a dozen or fourteen feet above water (or at least an acre four feet in depth) and dig a hole six times the average depth of the stream, twenty-two and a half feet deep, or considerable, *i. e.* three feet, deeper than any place in the main stream from Sudbury Causeway to Atkins's boat-house bend, and all this in fifty years.¹ Yet the depth under the bridge is only two and a half feet plus. It falls in four rods from two and a half to twenty-two and a half.

A considerable island has been formed there, at least

¹ *Vide* July 20th.

three feet and a half above low water, composed of sand, and, two or three rods lower, are deposited the stones, generally larger than a hen's egg, without sand, forming bars and islands quite distinct from the former. This is much the swiftest place on the stream thus far and deeper than any for twenty-five miles of [the] other stream, and consequently there is a great eddy, where I see cakes of ice go round and round in the spring, and, as usual, the shoal water and islands formed by the ruins of the bank and of the bottom are close by. As usual, the shoal water is produced by the rapidity of the current close by.

The sand and gravel are deposited chiefly in the immediate neighborhood of the swiftest water, the swift water producing an eddy. Hence, apparently, the sandy islands at the junction of the rivers, the sand-bar at the swift place on the Assabet, etc. Contract the stream and make it swift, and you will wear a deep hole and make sand-bars and islands below.

The stream is remarkably different from the other. It is not half so deep. It is considerably more rapid. The bottom is not muddy but sandy and occasionally stony. Though far shallower, it is less weedy than the other. In the above distance weeds do not anywhere grow quite across it. A shallowness of two and a half feet does not necessarily bring in weeds, and for long distances three feet is clear of weeds. This is owing, perhaps, not only to the greater swiftness of the current, but to the want of mud under the sand. The banks and bars are peculiar. They are commonly composed of a fine sand mixed with sawdust, shavings, etc., in which the

black willow loves to grow. I know of no such banks on the main stream.

Again there are comparatively few of the large floating potamogetons here. (I do not remember any of the very largest species.) The weeds are chiefly bur-reeds and a slenderer potamogeton and an immersed species (I speak of weeds in the middle). You wonder what makes the difference between this stream and the other. It seems impossible that it should be a geological difference in the beds of the streams so near together. Is it not owing simply to the greater swiftness of this stream? Does not this produce a sandy and gravelly and stony bottom, and so invite a different fauna and flora? I suspect that a fall of two or three inches more in a mile will produce a different fauna and flora to some extent, — the fresh-water sponge, the wood tortoise, the sucker, the kingfisher, the stone-heaps.

It is remarkable how the stones are separated from the sand at the Eddy Bridge and deposited in a bar or islands by themselves a few rods lower down. The sand-bar there, partly under water, looks exactly like a snow-drift. It is a narrow, sharp ridge, extending southwest from the island, with deep water on each side. The sand carried round by the eddy falls there where the ice is observed to loiter most. The large stones are perhaps swept away by a stronger current beneath.

The bars and banks of this stream are peculiar, *i. e.* of fine sand without mud. This indicates a fall and swifter water, and consequently it is on such a stream the mills are built and sawdust and shavings are mixed with such sand to form the bank. One such bank at the

swift place has been recently raised four or five feet above the present level by freshets. It is apparently advancing down-stream.



What is deposited by the eddy occasioned by the narrows is building it up, and so the stream is being narrowed further down. Eddies are the great builders of sand-bars and islands and banks. Any agent that stops the progress of the water downward builds up the bottom in some place.

At the bottom of the deep hole at Eddy Bridge, I felt several water-logged trunks of trees and saw some, which probably were carried round and round by the eddy until they became water-logged and sank.

July 18. One tells me that he stopped at Stedman Buttrick's on the 10th, and found him sitting under a cherry tree ringing a bell, in order to keep the birds off!

If you get on to a rock in the river, *rock* the boat, while you keep steadily pushing, and thus there will be moments when the boat does not rest on the rock at all, and you will rapidly get it off. The river is getting low, so that the entrances to musquash-holes in the bank are revealed and often laid bare, with fresh green rushes or flags, etc., in them.

Nathan Hosmer remembers that when the two new

stone piers at Hunt's Bridge were built, about 1820, one Nutting went under water to place the stones, and he was surprised to see how long he would remain under about this business. Nothing has got built without labor. Past generations have spent their blood and strength for us. They have cleared the land, built roads, etc., for us. In all fields men have laid down their lives for us. Men are industrious as ants.

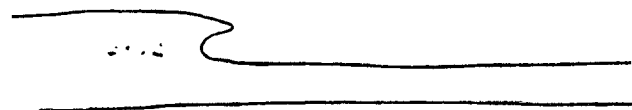
I find myself very heavy-headed these days. It occurs to me that probably in different states of what we call health, even in morbid states, we are peculiarly fitted for certain investigations, — we are the better able to deal with certain phenomena.

N. Barrett says that he has formerly cut six cocks of hay on his bar.

July 19. P. M. — Up Assabet.

The architect of the river builds with sand chiefly, not with mud. Mud is deposited very slowly, only in the stagnant places, but sand is the ordinary building-material.

It is remarkable how the river, while it may be encroaching on the bank on one side, preserves its ordinary breadth by filling up the other side. Generally speaking, up and down this and the other stream, where there is a swift place and the bank worn away on one side, — which, other things being equal, would leave the river wider there, — a bank or island or bar is being built up on the other, since the eddy where, on one side, sand, etc., are deposited is produced by the rapidity of the current, thus: —



e. g. north side of Egg Rock, at Hemlocks, at Pigeon Rock Bend, at Swift Place Bank, etc., and on main stream at Ash Tree Bend. The eddy occasioned by the swiftness deposits sand, etc., close by on one side and a little offshore, leaving finally a low meadow outside where was once the bed of the river. There are countless places where the one shore is thus advancing and, as it were, dragging the other after it.

I dug into that sand-bank, once sand-bar, at the narrow and swift place off Hildreth's, five and a half feet deep, this afternoon. It is more than a rod wide and covered with willows and alders, etc. It is built up four or five feet above the summer level. It is uniformly fine sand, more or less darkened with decayed vegetation, probably much of it sawdust, and it has been deposited this depth here by the eddy at high water within a very recent period. The same agent is in a great many places steadily advancing such a bar or bank down the stream a rod or more from the old shore. The more recent and lower extremity of this bank or bar is composed of sawdust and shavings, almost entirely so to a depth of two feet. Before it reaches the surface, pads spring up in it; when [it] begins to appear, pondweed shows itself, and bulrushes, and next black willows, button-bushes, etc. The finest black willows on the river grow on these sand-banks. They are also much resorted to by the turtles for laying their eggs. I dug up

three or four nests of the *Emys insculpta* and *Sternotherus odoratus* while examining the contents of the bank this afternoon. This great pile of dry sand in which the turtles now lay was recently fine particles swept down the swollen river.

Indeed, I think that the river once ran from opposite Merriam's to Pinxter Swamp and thence along Hosmer's hard land toward the bridge, and all the firm land north of Pinxter Swamp is such a sand-bank which the river has built (leaving its old bed a low meadow behind) while following its encroaching northeast side. That extensive hard land which the river annually rises over, and which supports a good growth of maples and swamp white oaks, will probably be found to be all alluvial and free from stones.

The land thus made is only of a certain height, say four to six feet above summer level, or oftener four or five feet. At highest water I can still cut off this bend by paddling through the woods in the old bed of the river. Islands are formed which are shaped like the curving ridge of a snow-drift.

Stagnant rivers are deep and muddy; swift ones shallow and sandy.

Scirpus subterminalis, river off Hoar's and Cheney's, not long.

July 20. The little Holbrook boy showed me an egg which I unhesitatingly pronounced a peewee's, given him by Joe Smith. The latter, to my surprise, declares it a meadow-hen's; saw the bird and young, and says the latter were quite black and had hen bills. Can it be so?

Humphrey Buttrick says he finds snipes' nests in our meadows oftener than woodcocks'.

P. M. — To Eddy Bridge.

Abel Hosmer says that the Turnpike Company did not fulfill their engagement to build a new bridge over the Assabet in 1807; that the present stone bridge was not built till about the time the Orthodox meeting-house was built. (That was in 1826.) Benjamin says it was built soon after the meeting-house, or perhaps 1827, and was placed some fifty feet higher up-stream than the old wooden one.

Hosmer says that the eddy and wearing away of the bank has been occasioned wholly by the bridge; that there was only the regular bend there before. He had thought that it was in consequence of the bridge being set askew or diagonally with the stream, so that the abutments turned the water and gave it a slant into the banks, thus:

I think that this did not create, only increased, the evil.

The bank which it has worn away rises

some sixteen feet above low water, and, considering the depth of the water, you may say that it has removed the sand to a depth of twenty-five feet over an area of a quarter of an acre, or say to the depth of three feet or a yard over two acres, or 9680 cubic yards or cartloads, which, at twenty-five cents per load, it would have cost \$2420 to move in the ordinary manner, or enough to fill the present river for a quarter of a mile, calling



it six rods wide and twelve feet deep. Beside creating some small islands and bars close by, this sand and gravel has, of course, been distributed along in the river and on the adjacent meadows below. Hosmer complains that his interval has accordingly been very much injured by the sand washed on to it below, — “hundreds of dollars” damage done to him. All this within some thirty-five¹ years.

It may well be asked what has become of all this sand? Of course it has contributed to form sand-bars below, possibly a great way below.

Jacob Farmer tells me that he remembers that when about twenty-one years old he and Hildreth were bathing in the Assabet at the mouth of the brook above Winn’s, and Hildreth swam or waded across to a sand-bar (now the island there), but the water was so deep on that bar that he became frightened, and would have been drowned if he had not been dragged out and resuscitated by others. This was directly over where that island is now, and was then only a bar beginning under water. That island, as he said, had been formed within thirty-five years,² or since the Eddy Bridge was built; and I suggest that it may have been built mainly of the ruins of that bank. It is the only island in the Assabet for two and a half miles.

There is a perfect standstill in the eddy at Eddy Bridge now, and there is a large raft of grass, weeds, and lumber perfectly at rest there, against Hosmer’s bank. The coarser materials — stones as big as a hen’s egg —

¹ Or thirty-two?

² Farrar (blacksmith) does not remember such a change.

are dropped close by, but the sand must have been carried far down-stream.

Hosmer says that when he digs down in his millet-field, twenty rods or more from the river, in his interval, at three or four feet depth he comes to coarse stones which look like an old bed of the river. I see them at each of the small wooden bridges, and very likely they underlie the whole of that interval, covered with sand. Such is the character of a river-bottom, — the stones from a hen’s egg to the size of your head dropped down to one level, the sand being washed away, and now found in one stratum.

So completely emasculated and demoralized is our river that it is even made to observe the Christian Sabbath, and Hosmer tells me that at this season on a Sunday morning¹ (for then the river runs lowest, owing to the factory and mill gates being shut above) little gravelly islands begin to peep out in the channel below. Not only the operatives make the Sunday a day of rest, but the river too, to some extent, so that the very fishes feel the influence (or want of *influence*) of man’s religion. The very rivers run with fuller streams on Monday morning. All nature begins to work with new impetuosity on Monday.

I see where turtles’ eggs are still being dug up!

July 21. P. M. — To Assabet, above factory.

For about one third the way from the factory dam to the powder-mills the river is broad and deep, in short a mill-pond.

¹ He should rather say Monday morning.

Harrington has what he calls his Elm Hole, where he thinks he finds the old bed of the river some ten rods from the present. The river in many places evidently once washed the base of hills, from which it is now separated by fifty rods of meadow.

The pontederia on the Assabet is a very fresh and clear blue to-day, and in its early prime, — very handsome to see. The *nesæa* grows commonly along the river near the powder-mills, one very dense bed of it at the mouth of the powder-mill canal.

The canal is still cluttered with the wreck of the mills that have been blown up in times past, — timber, boards, etc., etc., — and the steep hill is bestrewn with the fragments of the mills, which fell on it more than half a dozen years ago (many of them), visible half a mile off. As you draw near the powder-mills, you see the hill behind bestrewn with the fragments of mills which have been blown up in past years, — the fragments of the millers having been removed, — and the canal is cluttered with the larger ruins. The very river makes greater haste past the dry-house, as it were for fear of accidents.

July 22. Start just before 8 A.M. and sail to the Falls of Concord River.

Water $2\frac{1}{4}$ + inches above summer level. A southwest wind rises and blows us rapidly along.

We are early enough to see the light reflected from the sides of the gyrating water-bugs. Heard from a bittern above the factory yesterday, too large for the small one and too small, perhaps, for the large one, a peculiar hoarse, grating note, lazily uttered, — a bit-

tern's croak, — at 1 P. M., as it flew over the meadows, — a sound perfectly becoming the bird, far as possible from music.


Some have just begun to get the hay on our Great Meadows.

The peewee, our only beach-bird, teeters along the shore, reminding me that this is an arm of the ocean stream.

At Hill's Bridge we begin to find ourselves shut in by hills, and the character of the shores is fairly changed. There is very little meadow along the stream henceforward, but commonly a firm bank and pastures and cultivated fields — corn and potatoes — down to the shore, for it is commonly a firm shore, though it may be subject to inundation. The shores are still uninhabited, — the road being remote, — especially on the west side, and in the neighborhood of Middle Bridge we find ourselves off the middle of Billerica, the quiet town, and see its rural spire rising above the trees. Many handsome elm-tops and groves of elms are visible in Billerica. There is a fine grove of elms about the first house of the Atkins boat-house. Jug Island is a peculiar one, the only one of the kind that I know in the river, — except the small one at Falls, — firm and rocky, not made by the river, with deep water about it, especially on the east side, always separated from the shore, rising to a considerable height above the surface, — a part of the adjacent rocky range cut off by the river. The interval becomes more and more narrow and sandy or firm below this island and range of hills, and you see red-top and corn on it and woods.

For the last mile above the Falls the river becomes rocky, the rocks gradually increasing in number, until at the Falls its bed is crowded with them. Some of the rocks are curiously water-worn. They are, as usual in our black river, almost as black as ink, — the parts much submerged, — and I notice that bricks and white crockery on the bottom acquire the same color from the water, as if painted black. The water of this river is a black paint-brush which coats all things with fast colors. Rocks half a dozen feet in diameter which were originally of the usual lumpish form

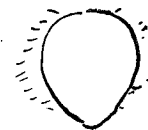


are worn thus  by the friction of the pebbles, etc., washed — against them by the stream at high water. Several of them have this peculiar sheaf-like form; and black as ink. But, though evidently worn into this form by the rush of water, they are by no means worn smooth, but are as rough as a grater, such being their composition. These are just above the Fordway. There are two pleasant old houses near the Fordway on the east side.

I was surprised to see on the upright sides of these rocks, one or two feet above the present water, very distinct white spots, looking like white paint across the river. Examining, I found them to be three fourths to one inch in diameter of an oval or circular form; the white coating spreading



on to the rock in an irregular fringe like the feet of an insect, increasing their resemblance to a bug, and they were raised one eighth or one tenth of an inch and finely dotted with the contained ova, reminding me of coins, — shaped like bugs or coins, — and I at first bent to read the inscriptions as if they were a work of art. They were full of ova with much water in them or other liquid.¹



Subtracting two and a quarter inches, I find the water at the Fordway, west side, two and one fourth feet deep, but generally not quite two feet.

Apparently the stream has been cleared of rocks and deepened on the westerly side at the Falls. At the narrowest place, where there is a willow in the middle, there is a clear channel on the west about thirty-five feet wide and four and a quarter feet deep (at deepest), or to the willow thirty-eight and a quarter feet, to opposite shore fifty-four feet more, and about two feet deep at deepest, with many rocks; in all say ninety-two feet.

We lunched about 12 o'clock (having got to the Falls about eleven), sitting on the largest rocky islet there, which, as I remember, may have been four to six rods long, but though it was not six feet above the water, if so much, there was no trace of the water ever having washed over it. Indeed, I *think* it does not rise more than five feet there ever, to judge from appearances. The obvious water-marks were about four feet above the present water. On this rock were dense trees and bushes, grass and soil, etc., etc., only five feet above the

¹ Vide Aug. 8th.

present surface and evidently not disturbed by water or ice.

In the very midst of the Falls, on the rocky ridge where is some earth, only a foot or two above the water, grows the nesæa, as also abundantly on the sides. The hibiscus is very common along the neighboring shores.

When I was here a month ago, the water being high, the current was very strong here, so that I could not paddle, perhaps could not have rowed a boat against it at the narrowest place; but now I can paddle against it there, and easily push about anywhere. When the water is high, then, it is strong and hard to resist at all falls and rapids. Now there is not so much of a rush as at the bridge near the powder-mills.

The shores at the Falls are firm and rocky, though for the most part covered densely with bushes, — maples, alders, grape-vines, cat-briars, etc. There is no space for the river to expand in, and it is withal very much contracted in capacity by the rocks in it. Its bed is more or less strewn with rocks for some sixty rods, the largest forming rocky isles with soil and bushes and trees on them, though only some five or maybe six (?) feet high. There is water six and a half feet deep between the Fordway and the narrowest place below.

I was surprised to see on the rocks, densely covering them, though only in the midst of the fall, where was the swiftest water, a regular seaweed, growing just like rockweed and of the same olive-green color, — "*Podostemon Ceratophyllum*, River-weed," — still in bloom, though chiefly gone to seed. Gray says it is "attached to loose stones," and Torrey says it "adheres to pebbles," but

here it covered the rocks under water in the swiftest place only, and was partly uncovered by the fall of the water. I found, in what I gathered, a little pout which had taken refuge in it. Though the botanist, in obedience to his rules, puts it among phænogamous plants, I should not hesitate to associate it with the rockweed. It is the rockweed of our river. I have never seen it elsewhere in the river, though possibly it grows at the factory or other swift places. It seemed as if our river had there for a moment anticipated the sea, suffered a sea-change, mimicked the great ocean stream. I did not see it a few rods above or below, where the water is more sluggish. So far as I know, then, it grows only in the swiftest water, and there is only one place, and that the Falls, in Concord River where it can grow. Gray only speaks of it as growing at "the bottom of shallow streams," Torrey says "at the bottom of shallow pebbly streams," and Bigelow only says it is attached to stones at the bottom. Yet apparently our sluggish river is only a stream, and sufficiently like ordinary rippling streams to admit of its growth at this one spot. A careless observer might confound it with the rockweed of the sea. It covers the rocks in exactly the same manner, and when I tore it off, it brought more or less of the thin, scaly surface of the rocks with it. It is a foretaste of the sea. It is very interesting and remarkable that at this one point we have in our river a plant which so perfectly represents the rockweed of the seashore. This is from four to eight or nine inches long. It has the peculiar strong fresh-water scent.

The west end of Hill's Bridge is (upper side of plank-

ing) eight feet eleven inches above summer level, under side of string-piece seven feet eight inches. I cannot hear that it ever rises on to this bridge, but there is a good deal of fresh drift stuff on the top of the abutment under the string-piece at seven feet eight inches above summer level, apparently washed on in the spring. The upper side of planking at east end is about nine feet eight inches above summer level.

At Turnpike Bridge the water has apparently washed away a part of the abutment some seven and a half feet above summer level.

At Middle Bridge, judging from water-marks on the piers, I should think the water might have risen there seven feet seven inches (more or less) above summer level, *i. e.* up to the timber which rests crosswise on the piers, twenty-two inches below top of planks.

A carpenter who lives (?) at Billerica Corner says the water stood all around the nearest inhabited two-story house to the bridge last spring, so that you could go round it in a boat. (It is the opposite side the road to the river.) I think that this proves a rise here of at least seven feet above summer level and perhaps more.

Therefore, as far as my observation goes, the rise of the river last spring from Sherman's Bridge to Billerica Corner Bridge was very uniform and to about the same height above summer level, but it must fall off rapidly two or three feet or more at the Falls.

I see neither of the small islands which are on Baldwin's map below the Atkins house.

It is a question if the river has as much created the shoal places as found them.

The shallowest place in all the river above described — also from Pelham Pond — is at the Fordway above the Falls, where it is not two and a half [feet] at deepest to-day, and generally only two feet, with a hard bottom and numerous rocks in its bed. It is quite fordable in a carriage.

The weediest place is at the Sudbury causeway. The most of a sand-bar *visibly* formed or forming is Barrett's Bar. If a large piece of meadow should lodge on this, it would help make an island of it rapidly.

The deepest and broadest place is in Fair Haven Pond. I think that the river proper is nowhere so wide as in some parts between Squaw [?] Harbor and Skelton Bend.

The presence or absence of weeds at a given shallowness is a good gauge of the rapidity of the current. At the Fordway they do not grow where it is only two feet on an average, owing to the swiftness of the current (as well as stoniness), and in the very swiftest and narrowest part of the Falls occurs one species, the *podostemon*, which I have not found in any other part of the river.

The muddiest are the most stagnant parts. The hibiscus and white maple do not occur on the main stream for a long distance above the mouth of the Assabet, maybe ten miles.

It is remarkable how the river, even from its very source to its mouth, runs with great bends or zigzags regularly recurring and including many smaller ones, first northerly, then northeasterly, growing more and more simple and direct as it descends, like a tree; as

if a mighty current had once filled the valley of the river, and meandered in it according to the same law that this small stream does in its own meadows.

A river of this character can hardly be said to fall at all: it rather runs over the extremity of its trough, being filled to overflowing. Its only fall at present (above *the* Falls and this side Framingham) is like the fall produced by a dam, the dam being in this case the bottom in a shallow. If, after flowing twenty miles, all the water has got to rise as high as it was when it started, or rather if it has got to pass over a bottom which is as high as that was where it started, it cannot be said to have gained anything or have fallen at all. It has not got down to a lower level. You do not produce a fall in the channel or bottom of a trough by cutting a notch in its edge. The bottom may lose as much as the surface gains.

Rocks which are covered by freshets a week or more will have lichens on them, as that on my old plan just below the Hemlocks.

If our river had been dry a thousand years, it would be difficult to *guess* even where its channel had been without a spirit level. I should expect to find water-worn stones and a few muddy pools and small swamps.

July 23. P. M. — To Walden.

Going through Thrush Alley and beyond, I am pestered by flies about my head, — *not till now* (though I may have said so before). They are perfect imps, for they gain nothing for their pains and only pester me. They do not for the most part attempt to settle on me;

never sting me. Yet they seriously interfere with walking in the wood. Though I may keep a leafy twig constantly revolving about my head, they too constantly revolve, nevertheless, and appear to avoid it successfully. They leave you only when you have got fairly out of the wood. They seem to do it for deviltry and sport.

The second and fourth, or lake-like, reaches of the river are those in which there is the least fall, if indeed there can be said to be any much of the year. A slight northerly wind, or a shower at the lower end, will make it easier to row up stream than down.

Low blackberries have begun.

I notice the scarlet leaves of the sand cherry, which grows in dry places, and skunk-cabbage leaves have now begun to decay, turning black, and the angelica fall has commenced along the brooks.

Rhexia in bloom, how long? What I call *Juncus scirpoides* is common at Hubbard's Close, and also what I call *Juncus marginatus* (somewhat like the *luzula*). *Prenanthes alba*, how long? See an early kind of wool-grass, done, of various sizes, and another with larger reflexed sheaths, not begun. *Aster Radula*, how long?

July 24. P. M. — To Ledum Swamp.

The hairy huckleberry still lingers in bloom, — a few of them. The white orchis will hardly open for a week. Mulgedium, how long?

Near the ditch beyond Dennis's Lupine Hill, a *vaccinium* near to *Pennsylvanicum*, perhaps a variety

of it, with ripe fruit, little or no bloom, broader-leaved than that, and not shining beneath but somewhat glaucous.

July 25. The Rice boy brings me what he thought a snipe's egg, recently taken from a nest in the Sudbury meadows. It is of the form of a rail's egg, but is not whitish like mine, but olive-colored with dark-brown spots. Is it the sora rail? He has also a little egg, as he says taken out of a thrasher's nest, apparently one third grown.

Flagg says that the chimney swallow is sometimes abroad "the greater part of the night;" is informed by Fowler that the rose-breasted grosbeak often sings in the light of the moon.

P. M. — Water three and a half inches above summer level. I measure the rapidity of the river's current. At my boat's place behind Channing's, a bottle sunk low in the water floats one hundred feet in five minutes; one hundred feet higher up, in four and a half minutes. (I think the last the most correct.) It came out a rod and a half ahead of two chips.

July 26. P. M. — To Great Meadows.

I see in Clark's (?) land, behind Garfield's, a thick growth of white birches, apparently three years old, blown from the wood on the west and southwest.

Looking from Peter's, the meadows are somewhat glaucous, with a reddish border, or bank, by the river, where the red-top and *Agrostis scabra* grow, and a greener stream where the pipes are, in the lowest part, by the

Holt, and in some places yellowish-green ferns and now brown-topped wool-grass.

There is much of what I call *Juncus, scirpoides* now in its prime in the wetter parts, as also the *Eleocharis palustris*, long done, and *Rhynchospora alba* lately begun. Also buck-bean by itself in very wet places which have lost their crust.

Elodea, how long?

Now observe the darker shades, and especially the apple trees, square and round, in the northwest landscape. Dogdayish.

Methinks the hardhack leaves always stand up, for now they do, and have as soon as they blossomed at least.

July 28. P. M. — Up Assabet.

I see what I take to be young purple finches eating mountain-ash berries (ours). The kingbirds eat currants.

I notice that the common greenish rock lichen (*Parmelia*) grows on the rocks of the Assabet down to within two feet of summer level; *i. e.*, it is submerged perhaps one fourth part of the year.

The black willows are the children of the river. They do not grow far from the water, not on the steep banks which the river is wearing into, not on the unconverted shore, but on the bars and banks which the river has made. A bank may soon get to be too high for it. It grows and thrives on the river-made shores and banks, and is a servant which the river uses to build up and defend its banks and isles. It is married to the river.

Where an eddy is depositing a sand-bar, anon to be elevated into an island or bank, there especially the black willow flourishes. There are certain trees and other plants, as this, the white maple, mikania, etc., which do not grow away from the riverside. The river has not simply to [*sic*] their base, but they accompany *it*, wherever it goes.

The season has now arrived when I begin to see further into the water, — see the bottom, the weeds, and fishes more than before. I can see the bottom when it is five and a half feet deep even, see the fishes, especially the perch, scuttling in and out amid the weeds. Has this clarity anything to do with the greater sluggishness of the water when low? Perhaps you can see furthest into the most sluggish water.

If a tree is undermined and swept down-stream, it lodges in some shallow place, with its branches down-stream, and its butt on the surface, pointing up.


The sweet and plaintive note of the pewee (wood pewee) is now prominent, since most other birds are more hushed. I hear probably young families of them answering each other from a considerable distance, especially about the river. Hear also part of the song of what sounds and looks like a rose-breasted grosbeak. Saw young martins being fed on a bridge-rail yesterday.

July 29. P. M. — To Fair Haven Hill shore.

Ranunculus Flammula var. *reptans* out, also *impatiens*, *noli-me-tangere*. The *Cyperus dentatus* in bloom on hard sandy parts of meadows now is very interesting and handsome on being inspected now, with its

bright chestnut purple *sided* flat spikelets, — a plant and color looking toward autumn. Very neat and handsome on a close inspection. *Vide* about Hubbard's brook pickerel ditches. Also in dry sandy soil the little tufts of *Fimbristylis capillaris* in bloom are quite brown and withered-looking now, — another yet more autumnal-suggesting sight. In dry pastures see also the round green heads of the *Cyperus filiculmis*.

The river is very nearly down to summer level now, and I notice there, among other phenomena of low water by the river, the great yellow lily pads flat on bare mud, the *Ranunculus Flammula* (just begun), a close but thin green matting now bare for five or six feet in width, bream nests bare and dried up, or else bare stones and sand for six or eight feet. The white lilies are generally lifted an inch or two above water by their stems; also the *Utricularia vulgaris* and *purpurea* are raised higher above the surface than usual. Rails are lodged amid the potamogetons in midstream and have not moved for ten days. Dog-days and fogs. Rocks unsuspected peep out and are become visible. The water milfoil (the *ambiguum* var. *natans*), otherwise not seen, shows itself. This is observed only at lowest water.

I examined some of these bream nests left dry at Cardinal Shore. These were a foot or two wide and excavated five inches deep (as I measured) in hard sand. The fishes must have worked hard to make these holes. Sometimes they are amid or in pebbles, where it is harder yet. There are now left at their bottoms, high and dry, a great many snails (*Paludina decisa*, also , young and old, some very minute. They either

wash into them or take refuge there as the water goes down. I suspect they die there. The fishes really work hard at making their nests — these, the stone-heaps, etc. — when we consider what feeble means they possess.

Vaccinium vacillans begin to be pretty thick and some huckleberries. See large flocks of red-wings now, the young grown. *Bartonia tenella*, how long?

July 30. A. M. — On river to ascertain the rate of the current.

This dog-day weather I can see the bottom where five and a half feet deep. At five feet it is strewn clear across with sium, heart-leaf, *Ranunculus Purshii*, etc. It is quite green and verdurous, especially with the first. I see the fishes moving leisurely about amid the weeds, their affairs revealed, especially perch, — some large ones prowling there; and pickerel, large and small, lie imperturbable.

I see more moss(?) -covered rocks on the bottom and some rising quite near the surface, — three or four between my boat's place and thirty rods above, — and a good many three feet over on the bottom, revealed in the sunny water, and little suspected before. Indeed, the bottom may be considered rocky from above Dodd's to my boat's place, though you would suspect it only when looking through this clear water. They are so completely covered with moss-like weeds or tresses that you do not see them, — like the heads of mermaids. A rock there is a nucleus or hard core to a waving mass of weeds, and you must probe it hard with a paddle to detect the hard core. No doubt many a

reach is thus rock-strewn which is supposed to have an uninterruptedly muddy bottom. They sleep there concealed under these long tresses on the bottom, suggesting a new kind of antiquity. There is nothing to wear on and polish them there. They do not bear the paint rubbed off from any boat. Though unsuspected by the oldest fisher, they have eyed Concord for centuries through their watery veil without ever parting their tresses to look at her.

Perchance the increased stagnancy of the river at this season makes the water more transparent, it being easier to look into stagnant water than when the particles are in rapid motion.

The outside heart-leaves above Dodd's grow in six feet of water, and also the kalmiana lily. Trying the current there, there being a very faint, chiefly side, wind, commonly not enough to be felt on the cheek or to ripple the water, — what would be called by most a calm, — my bottle floats about seventy-five feet in forty minutes, and then, a very faint breeze beginning to drive it back, I cannot wait to see when it will go a hundred. It is, in short, an exceedingly feeble current, almost a complete standstill. My boat is altogether blown up-stream, even by this imperceptible breath. Indeed, you can in such a case feel the pulse of our river only in the shallowest places, where it preserves some slight passage between the weeds. It faints and gives up the ghost in deeper places on the least adverse wind, and you would presume it dead a thousand times, if you did not apply the nicest tests, such as a feather to the nostrils of a drowned man. It is a mere

string of lakes which have not made up their minds to be rivers. As near as possible to a standstill.

Yet by sinking a strawberry box beneath the surface I found that there was a slight positive current there, that when a chip went pretty fast up-stream in this air, the same with the box sunk one foot and tied to it went slowly down, at three feet deep or more went faster than when the box was sunk only one foot. The water flowed faster down at three feet depth than at one, there where it was about seven feet deep, and though the surface for several inches deep may be flowing up in the wind, the weeds at bottom will all be slanted down. Indeed, I suspect that at four or five feet depth the weeds will be slanted downward in the strongest wind that blows up, in that the current is *always* creeping along downward underneath. After my first experiments I was surprised to find that the weeds at bottom slanted down-stream.

I have also been surprised to find that in the clear channel between the potamogetons, though it looked almost stagnant, it was hard to swim against it; as at Rice's Bend.

See many cowbirds about cows.

P. M. — Left boat at Rice's Bend. I spoke to him of the clapper rail. He remembered that his father once killed a bird, a sort of mud-hen, which they called the tinker, since he made [a] noise just like a tinker on brass, and they used to set it agoing in the meadows by striking two coppers together. His father stuffed it and did not know what it was. It had a long body.

Yet the river in the middle of Concord is swifter than

above or below, and if Concord people are slow in consequence of their river's influence, the people of Sudbury and Carlisle should be slower still.

July 31. 7.30 A. M. — Up river.

C. and I, having left our boat at Rice's Bend last night, walk to it this forenoon on our way to Saxonville.

Water three quarters of an inch above summer level.

It is emphatically one of the dog-days. A dense fog, not clearing off till we are far on our way, and the clouds (which did not let in any sun all day) were the dog-day fog and mist, which threatened no rain. A muggy but comfortable day.

As we go along the Corner road, the dense fog for a background relieves pleasantly the outlines of every tree, though only twenty rods off, so that each is seen as a new object, especially that great oak scrag behind Hubbard's, once bent into a fence, now like a double-headed eagle, dark on the white ground. We go in the road to Rice's on account of the heavy dew, yet the fine tops of red-top, drooping with dew over the path, with a bluish hue from the dew, — blue with dew, — wet our shoes through. The roads are strewn with meadow-hay, which the farmers teamed home last evening (Saturday).

The grass is thickly strewn with white cobwebs, tents of the night, which promise a fair day. I notice that they are thickest under the apple trees. Within the woods the mist or dew on them is so very fine that they look smoke-like and dry, yet even there, if you put your finger under them and touch them, you take off the dew

and they become invisible. They are revealed by the dew, and perchance it is the dew and fog which they reveal which are the sign of fair weather. It is pleasant to walk thus early in the Sunday morning, while the dewy napkins of the cobwebs are visible on the grass, before the dew evaporates and they are concealed.

Returning home last evening, I heard that exceedingly fine z-ing or creaking of crickets (?), low in the grass in the meadows. You might think it was a confused ringing in your head, it is so fine. Heard it again toward evening. Autumnalish.

On the 26th I saw quails which had been picking dung in a cart-path. Probably their broods are grown.

The goldfinch's note, the cool watery twitter, is more prominent now.

We had left our paddles, sail, etc., under one of Rice's buildings, on some old wagon-bodies. Rice, who called the big bittern "cow-poke, baked-plum-pudding."

It is worth the while to get at least a dozen miles on your journey before the dew is off. Stopped at Weir Hill Bend to cut a pole to sound with, and there came two real country boys to fish. One little fellow of seven or eight who talked like a man of eighty, — an old head, who had been, probably, brought up with old people. He was not willing to take up with my companion's jesting advice to bait the fish by casting in some of his worms, because, he said, "It is too hard work to get them where we live."

Begin to hear the sharp, brisk *dittle-ittle-ittle* of the wren amid the grass and reeds, generally invisible.

I only hear it between Concord line and Framingham line.

What a variety of weeds by the riverside now, in the water of the stagnant portions! Not only lilies of three kinds, but heart-leaf, *Utricularia vulgaris* and *purpurea*, all (at least except two yellow lilies) in prime. Sium in bloom, too, and *Bidens Beckii* just begun, and *Ranunculus Purshii* still.

The more peculiar features of Concord River are seen in these stagnant, lake-like reaches, where the pads and heart-leaf, pickerel-weed, button-bush, utricularias, black willows, etc., abound.

Above the Sudbury causeway, I notice again that remarkable large and tall typha, apparently *T. latifolia* (yet there is at least more than an inch interval between the two kinds of flowers, judging from the stump of the sterile bud left on).¹ It is seven or eight feet high (its leaves), with leaves flat on one side (only concave at base, the sheathing part) and regularly convex on the other. They are so much taller than any I see elsewhere as to appear a peculiar species. Long out of bloom. They are what you may call the tallest reed of the meadows, unless you rank the arundo with them, but these are hardly so tall.

The button-bush, which is, perhaps, at the height of its bloom, resounds with bees, etc., perhaps as much as the bass has. It is remarkable that it is these late flowers about which we hear this susurrus. You notice it with your back to them seven or eight rods off.

See a blue heron several times to-day and yesterday.

¹ Vide [p. 273].

They must therefore breed not far off. We also scare up many times green bitterns, perhaps young, which utter their peculiar note in the Beaver Hole Meadows and this side.

For refreshment on these voyages, [we] are compelled to drink the warm and muddy-tasted river water out of a clamshell which we keep, — so that it reminds you of a clam soup, — taking many a sup, or else leaning over the side of the boat while the other leans the other way to keep your balance, and often plunging your whole face in at that, when the boat dips or the waves run.

At about one mile below Saxonville the river winds from amid high hills and commences a great bend called the Ox-Bow. Across the neck of this bend, as I paced, it is scarcely twenty rods, while it must be (as I judged by looking, and was told) a mile or more round. Fishermen and others are accustomed to drag their boats overland here, it being all hard land on this neck. A man by the bridge below had warned us of this cut-off, which he said would save us an hour!

A man fishing at the Ox-Bow said without hesitation that the stone-heaps were made by the sucker, at any rate that he had seen them made by the sucker in Charles River. — the large black sucker (not the horned one). Another said that the water rose five feet above its present level at the bridge on the edge of Framingham, and showed me about the height on the stone. It is an arched stone bridge, built some two years ago.

About the Sudbury line the river becomes much narrower and generally deeper, as it enters the first large

meadows, the Sudbury meadows, and is very winding, — as indeed the Ox-Bow was. It is only some thirty or forty feet wide, yet with firm upright banks a foot or two high, — canal-like. This canal-like reach is the transition from the Assabet to the lake-like or Musketaquid portion. At length, off Pelham Pond, it is almost lost in the weeds of the reedy meadow, being still more narrowed and very weedy, with grassy and muddy banks. This meadow, which it enters about the Sudbury line, is a very wild and almost impenetrable one, it is so wet and muddy. It is called the Beaver-Hole Meadows and is a quite peculiar meadow, the chief growth being, not the common sedges, but great bur-reed, five or six feet high and all over it, mixed with flags, *Scirpus fluviatilis*, and wool-grass, and rank canary grass. Very little of this meadow can be worth cutting, even if the water be low enough. This great sparganium was now in fruit (and a very little in flower). I was surprised by the sight of the great bur-like fruit, an inch to an inch and a half in diameter, the fruit-stems much branched and three or four feet high. It is a bur of sharp-pointed cones; stigmas linear. I can hardly believe that this is the same species that grows in C.

It is apparently much earlier than ours. Yet ours may be a feeble growth from its very seeds floated down.

Can it be that in this wild and muddy meadow the same plant grows so rankly as to look like a new species? It is decidedly earlier as well as larger than any I find in C. It does not grow in water of the river, but densely, like flags, in the meadow far and wide, five or six feet

high, and this, with the *Scirpus fluviatilis*, etc., makes a very novel sight. Where there are rare, wild, rank plants, there too some wild bird will be found. The marsh wrens and the small green bitterns are especially numerous there. Doubtless many rails here. They lurk amid these reeds. Behind the reeds on the east side, opposite the pond, was a great breadth of pontederia. *Zizania* there just begun.

This wren (excepting, perhaps, the red-wing black-bird) is the prevailing bird of the Sudbury meadows, yet I do not remember to have heard it in Concord. I get a nest,¹ suspended in a patch of bulrush (*Scirpus lacustris*) by the river's edge, just below the Sudbury causeway, in the afternoon. It is a large nest (for the bird), six inches high, with the entrance on one side, made of coarse material, apparently withered bulrush and perhaps pipes and sedge, and no particular lining; well woven and not very thick; some two and a half or three feet above water. The bird is shy and lurks amid the reeds.

We could not now detect any passage into Pelham Pond, which at the nearest, near the head of this reach, came within thirty rods of the river.

Do not the lake-like reaches incline to run more north and south?

The potamogetons do not abound anywhere but in shallows, hence in the swifter places. The lake-like reaches are too deep for them.

¹ Rice saw one in his meadow (at the Dam Meadows) in Concord half a dozen years ago. I hear of another in Nine-Acre Corner this year.

Cardinal-flower. Have seen it formerly much earlier. Perhaps the high water in June kept it back.

This sixteen miles up, added to eleven down, makes about twenty-seven that I have boated on this river, to which may be added five or six miles of the Assabet.