

Description of all present and past RIVERS and OLT sites

GE-1 Pine River, Elm Street, Effingham.

Biweekly (Apr-Oct) 2002-2012

Mean levels for all parameters were within the acceptable range for surface waters according to state standards. Dissolved Organic Nitrogen dominates Dissolved Inorganic Nitrogen at this site, and total phosphorus, sodium and chloride levels remained below natural background levels for New Hampshire surface waters. Silica levels at this site were one of the highest of all sites tested, indicating that the Pine River receives more groundwater flow than other sites or some other inputs of silica. In fact, the stratified drift aquifer is at its closest point to the surface near this site. Silica levels also increased slightly over the sampling period, and turbidity levels remained stable. Conductivity levels slightly decreased over the sampling period, but were elevated in 2007 above natural background levels. Dissolved organic carbon has been slightly elevated at this site in the past, possibly due nearby wetlands, although levels remain within the typical range for surface waters and decreased over the sampling period.

The Pine River flows from the southern boundary of the Ossipee Watershed, through the Pine River State Forest, through several wetlands including Heath Pond Bog and into Ossipee Lake near Ossipee Lake Natural Area. GE-1 is located where the Pine River flows under Elm Street. The site is in the downstream shadow of a modern bridge with substantial concrete abutments. A access lane leads to the site, which is obviously used regularly by recreational fishermen and beer drinkers. The river is about twenty feet wide. The current is steady enough to bend the subsurface weeds, but there are no surface ripples. Both up and downstream from the site, the river is open to the sky and mostly pines set back from both banks. This site was chosen because it is located downstream of two gravel pits as well as a designated drinking water zone. This site was also easily accessible.

GE-2 South River, Plantation Road, Parsonsfield, Maine.

Biweekly (Apr-Oct) 2002-2012

Mean levels for all parameters except for pH and dissolved oxygen were within the acceptable range for surface waters according to state standards. Dissolved Organic Nitrogen dominates Dissolved Inorganic Nitrogen at this site, and total phosphorus, sodium and chloride levels remained below natural background levels for New Hampshire surface waters. Dissolved organic carbon concentrations remained elevated but decreased slightly over the sampling period, and this site had some of the highest mean concentration of DOC of all sites tested. Extensive wetlands above this site are responsible for the elevated DOC concentrations, lower dissolved oxygen and lower pH. Silica levels remained slightly elevated and increased slightly over the sampling period. Conductivity levels slightly increased over the sampling period and were elevated on two occasions above natural background levels in the summer and fall of 2007 and 2008. pH and turbidity levels decreased over the sampling period, as did dissolved oxygen. From 2006-2010, the macroinvertebrate composition at the South River was indicative of a river in 'good' condition.

The South River flows from Province Lake and Lords Lake, through several wetlands and into Maine where it joins the Ossipee River. GE-2 is located just below the outlet of Lords Lake on Plantation Road. The testing site is immediately upstream from an aging concrete and steel bridge; the abutments are decaying and have clearly dropped cement into the river some twenty feet below the actual test site. At the site, the river is about twenty feet wide, perhaps four to five feet deep toward the middle of the stream. The current is strong; there are several small rapids above and below the site. Much of the site gets direct sunlight, but the surrounding trees, mostly deciduous, overhang the river somewhat. There is some evidence of fishing activity. This site was chosen because it is located downstream of the town's transfer station and capped landfill. Potential road run-off is a concern as well. The site was also easily accessible.

GE-3 Ossipee River, Effingham Falls.

Biweekly (Apr-Oct) 2003-2012

Monthly (Winter) 2004-2012

Mean levels for all parameters were within the acceptable range for surface waters according to state standards. Dissolved Organic Nitrogen dominates Dissolved Inorganic Nitrogen at this site, and total phosphorus, sodium and chloride levels remained below natural background levels for New Hampshire surface waters. The Ossipee River continued to exhibit some of the highest temperatures in the watershed, most likely due to its location below the dam where warmer lake water flows out of Berry Bay. Conductivity levels remained below natural background levels for state surface waters, and appear to be stable over the sampling period, while turbidity levels slightly increased.

The Ossipee River drains Ossipee Lake. GE-3 is located just below the Ossipee Lake dam. The flow is rapid, and the water level is largely variable due to dam height and precipitation. Downstream the river turns to a slower moving meandering stream as the channel widens. The bottom is mostly gravel with sparse boulders and cobble. The stream is approximately 15-20 feet wide. Red maple, white pine, and bushes dominate the landscape around the site with a sandy top soil and a fine sand soil underneath. There are often fisherman here as this is a popular fishing site. People fish for rainbow trout just below the dam and rainbow trout at the site. Because this is such a popular fishing site there is also unfortunately a lot of trash here. The site is accessed via Ironworks road where the tester parks at the Ossipee Lake Dam. The site is located at the end of the path downstream of the dam on the northern side of the stream. This site was chosen to determine the quality of water as it leaves Ossipee Lake.

GE-4/4u Red Brook, Green Mountain Road, Effingham.

Sporadic 2005-2007

Data for this site is based on a handful of samples, as the stream is intermittent and not a regular testing site. Based on those data, Dissolved Organic Nitrogen dominates Dissolved Inorganic Nitrogen, conductivity, sodium and chloride levels remained below natural background levels for New Hampshire surface waters. Total phosphorus levels were elevated on one occasion, and could be attributed to lab error. Dissolved oxygen levels measured at this site were regularly below state standards, and the pH at this site was the lowest of all sites - well below naturally occurring levels. The site also exhibited the highest dissolved organic carbon levels and one of the highest total dissolved nitrogen levels in the watershed, although as mentioned above, DON dominated DIN. Poorer water quality is most likely due to restrictions to flow and the resulting stagnation of water upstream of a narrow and highly-placed culvert. Continued sampling and further investigation is recommended for this site, as well as adjustments to the culvert that is inhibiting the natural flow.

THIS BROOK ORIGINATES ON GREEN MOUNTAIN AND RUNS THROUGH SOME PRIVATE LANDS BEFORE REACHING GREEN MOUNTAIN ROAD. IT THEN FLOWS INTO SOME EXTENSIVE WETLANDS BEFORE DRAINING INTO OSSIPEE LAKE. THIS SITE WAS A PILOT SITE IN 2005 AND WAS CHOSEN TO DEMONSTRATE HOW A WETLANDS SYSTEM FUNCTIONS AS THE SITE IS LOCATED UPSTREAM FROM A WETLANDS AND TRIBUTARY TESTING SITE, OL-7

GEA-1 Long Pond outlet, Route 153, Eaton (pilot site in 2013)

This site is located in the outlet stream south of Long Pond in Eaton. An unnamed private association road approximately 150 feet northeast of Youngs Road along Route 153 crosses the flow. This site was added to help get a better picture of phosphorus concentrations in the Danforth Pond watershed.

GF-1 Danforth Brook, Ossipee Lake Road, Freedom.

Biweekly (Apr-Oct) 2002-2012

Mean levels for all parameters were within the acceptable range for surface waters according to state standards. Dissolved Organic Nitrogen dominates Dissolved Inorganic Nitrogen at this site, and total phosphorus, sodium and chloride levels remained below natural background levels for New Hampshire surface waters. Danforth Brook continues to exhibit some of the highest temperatures in the watershed, most

likely because it is the outlet where warmer lake water flows out of Lower Danforth Pond. Dissolved oxygen only rarely fell below state standards, and pH levels were slightly acidic and decreased over the sampling period. Conductivity levels remained stable over the sampling period, while turbidity levels slightly increased.

GF-1 is located where Danforth Brook flows under Ossipee Lake Road. It is a slow moving stream from Danforth Bay to Broad Bay. It is about 20 feet wide by 3-4 feet deep. Testing site is on the exit of Danforth about 150 feet. There is some outboard boat traffic entering Danforth from Broad Bay (1/day), but mostly canoe and kayak (2-3/day). Agitation exists in Danforth due to boat motors and water skiing. Site is surrounded by dense riparian vegetation. Some of this vegetation was cut early during the sampling season in 2003 and left exposed gravel. This test site was chosen to determine the impact of road run-off. Additional considerations were its accessibility and the fact that a previous study had been conducted.

GF-2 Cold River, Maple Street Bridge, Freedom Biweekly (Apr-Oct) 9/2002-2008

Mean levels for all parameters except for pH and dissolved oxygen were within the acceptable range for surface waters according to state standards. As with most sites in the Ossipee Watershed, water at this site was slightly acidic. Dissolved Organic Nitrogen dominates Dissolved Inorganic Nitrogen at this site, sodium and chloride levels remained below natural background levels for New Hampshire surface waters. Total phosphorus and phosphate levels remained stable over the sampling period, and on one occasion in 2007 total phosphorus levels rose above natural background levels. Total phosphorus levels are slightly elevated and higher than the sampling site downstream (GF-3), most likely due to the stagnation of water and build up of materials behind the dam. Nitrate levels and conductivity levels at this site increased slightly over the sampling period, as did turbidity. This site consistently exhibited some of the highest magnesium levels in the watershed, increasing slightly over the sampling period, and silica levels have been higher at this site, indicating groundwater input.

GF-2 is located in downtown Freedom Village where the Cold Brook flows under Maple Street. The sampling site is about 30 feet upstream from the dam that holds the Mill Pond. The pond is about 150 ft long, 20-25 feet across, with an average depth under 6 feet. The actual sample site is located within 10 feet of a bridge that carries much of the auto and foot traffic within the village of Freedom. The pond is quite still during most of the summer as water does not flow over the top of the dam, just through a particular spillway. There is little human interaction with the water in the pond except when it is stocked for the kids fishing derby and the plastic duck race. This test site was chosen to determine the impact of road run-off and because the Brook runs through the village of Freedom and is easily accessible. An additional consideration was that the Freedom Conservation Commission has data on this site that had been gathered over a 20 year period.

GF-3 Cold River, Inlet to Loon Lake, Freedom. Biweekly (Apr-Oct) 2003-2012 Monthly (Winter) 2004-2012

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. Dissolved Organic Nitrogen dominates Dissolved Inorganic Nitrogen at this site, sodium and chloride levels remained below natural background levels for New Hampshire surface waters. This site had the highest mean sulfate level among testing sites, with two spikes in 2005 and 2006. Total phosphorous was elevated above natural background levels on one occasion in 2006, but was typically below background levels and stable overall. Similar to the site GF-2 upstream, silica levels have been higher at this site, indicating groundwater input. Also similar to GF-2, this site has some of the highest magnesium levels in the watershed. Conductivity levels at this site slightly increased over the sampling period, as did turbidity levels. From 2006-2010 sampling showed macroinvertebrate composition in Cold Brook that was indicative of streams with 'excellent' water quality.

Cold Brook flows through Freedom Village and over a dam, just below GF-2, and into Loon Lake. GF-3 is several hundred yards upstream of the Cold Brook inlet to Loon Lake. The sampling site substrate consists mostly of gravel with minimal aquatic vegetation. A swiftly moving riffle is directly upstream, but the flow is

slower at the site. The stream is approximately 5-6 feet wide. The site is surrounded by a mixed hardwood forest of ash, basswood, red maple, white oak, hemlock, and beech with a large amount of large white pines on the eastern side of the river. The herbaceous layer consists mostly of asters, golden rod, and ferns. There is a thick top soil with plenty of leaf litter. The gravelly beach where sampling occurs is lined by grass. There are few obvious human influences at the site. There is a farm house upstream and a cemetery directly next to the site. Various wildlife inhabits the area including beaver and otter. The site is accessed via Maple Road where the tester parks at the cemetery. The site is just over the bank behind the cemetery. There is a path down the bank that goes to the right and the site is a little further to the right from this path at a gravelly beach on the stream situated between two white pines just off shore. This site was chosen because of concern over potential malfunctioning septic systems in Freedom Village.

GM-1 Banfield Brook, Route 113, Madison.

Biweekly (Apr-Oct) 2002-2012

Monthly (Winter) 2004-2012

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. Sodium, chloride and calcium levels at this site were among the highest in the watershed, frequently above typical background levels for NH surface waters and indicate influence from road salting activities, although chloride levels remained stable and sodium levels slightly decreased over the sampling period. Conductivity levels at this site were also among the highest in the watershed and were often above typical surface water levels found under natural conditions, and slightly increased over the sampling period. Magnesium levels were slightly elevated when compared to other sites in the watershed and a spike occurred in 2007, although these levels were relatively low overall and remained stable over the sampling period. Although Dissolved Organic Nitrogen dominates Dissolved Inorganic Nitrogen at this site, nitrate levels slightly increased over the sampling period and were elevated when compared with other sites in the Watershed. Higher levels of silica at this site indicate groundwater input, and along with higher nitrate levels, suggest that the aquifer could contain elevated levels of DIN. In 2006 and 2007 the macroinvertebrate community composition at a location just upstream of the site was indicative of a stream in 'good' condition. However, from 2008-2010 sampling showed 'fairly poor' water quality conditions and this shift in the macroinvertebrate community could be caused by the high sodium and chloride levels and the increasing nitrate.

While not in the Ossipee Watershed, this site is in the greater Saco Watershed. The brook comes down from Pea Porridge Pond in Madison and runs under Route 113. There are some houses along the brook's upper reaches in the Eidelweiss development. Banfield is rocky, with generally clear water. It tumbles down over a low concrete ledge ten feet before our testing site. In the summer there are water striders on the surface of the brook. This test site was chosen to determine the impact of road run-off, erosion and timber cutting to Pea Porridge Ponds. The stream also flows through the Eidelweiss development, located upstream of test site.

GM-2 Pequawket Brook, Route 113, Madison.

Biweekly (Apr-Oct) 2003, 2006-2012

Mean levels for all parameters except for pH and dissolved oxygen were within the acceptable range for surface waters according to state standards. This site exhibited the highest nitrate levels recorded in the watershed, and levels increased over the sampling period. The anthropogenic sources of nitrate at this site should be investigated. As with most sites in the Ossipee Watershed, water at this site was slightly acidic, and this site in particular had one of the lowest mean pH levels in the watershed. Dissolved oxygen levels measured at this site were regularly below state standards, and these levels decreased over the sampling period. Conductivity levels were slightly elevated, but generally fell below levels that would indicate human disturbance, and slightly decreased over the sampling period. Sodium and chloride levels remained stable over the sampling period but were elevated above natural background levels on a few occasions in 2007, and turbidity levels slightly increased. Surges in phosphate observed in the past were not observed 2006-2008, and levels decreased slightly over the sampling period. Dissolved organic carbon was slightly elevated when compared with other sites, however, levels decreased over the sampling period. Dissolved Inorganic Nitrogen

dominated TDN at this site, indicating impairment. Higher levels of silica at this site indicate groundwater input, and along with higher nitrate levels, suggest that the aquifer could contain elevated levels of DIN.

While not in the Ossipee Watershed, this site is in the greater Saco Watershed. GM-2 is off 113. It flows from a wetland at the edge of the watershed. There is a steep incline down to stream. The area surrounding the site is moderately wooded with deciduous trees. A large gravel operation near the stream is buffered only by twenty feet of forest. An abandon road leads up to stream embankment. Various wildlife such as beaver and river otter has been noted at the site occasionally. There is some erosion along banks and some dead fall of trees. Depth of stream varies with amount of rainfall. Stream has some aquatic growth and rocky/sandy in areas. This site was chosen because it's down stream of a large gravel operation.

GM-3 Forrest Brook, Silver Lake Hardware, Rt. 113, Madison. Biweekly (Apr-Oct) 2004-2012

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. Sodium and chloride levels remained below natural background levels for New Hampshire surface waters. Phosphate levels were elevated in 2005, and this site continued to have some of the highest levels of nitrate in the watershed, though overall levels were relatively low when compared with sites GM-1 and GM-2 in Madison. Dissolved Inorganic Nitrogen was approximately equal to the Dissolved Organic Nitrogen indicating possible impairing inputs. It is known that an upstream well at the convenience store across the stream has a nitrogen impairment, possibly due to a failed septic system. Higher levels of silica at this site indicate groundwater input, and along with higher nitrate levels, suggest that the aquifer could contain elevated levels of DIN. From 2006-2010 sampling just upstream showed that the macroinvertebrate community is indicative of 'good' quality streams.

Forrest Brook, at the test site, has a smooth, slow-moving surface. The stream is about twelve feet wide, and the clear water carries very little amounts of floating matter: some bubbles/foam, leaves, bits of tree bark, and water striders. At the test site, the water has varied during the summer from 12 inches to less than 6 inches deep, depending on area rainfall. Both upstream and downstream are areas of shallower water where the stream burbles actively over rocks. The stream bottom consists of sand, gravel and cobble. There is a brown film, which may be mineralization/decay of the rocks, or decomposed organic matter, or some kind of algae. Whatever the cause, the film is rough rather than slimy. Additionally, on the stream bottom lie pieces of tree detritus from overhanging trees and some leaves hinting of the nearness of autumn's arrival. The site is on the west side of the stream about twenty-five meters downstream from the culvert that carries Route 113 over the stream, and some eight feet down the road. (The culvert is the usual half-circle of corrugated, somewhat rusted, metal that highway departments install.) The site is reached by an undistinguished path from the parking lot of the Silver Lake Home Center down to the stream some ten meters downstream from the test site, and then along the stream, the detour necessitated by poison ivy just upslope from the test site. At the sample site, the stream flows south to north. To the west, the land rises about five feet up a gentle slope to its floodplain (on which Silver Lake Home Center is built); to the east, there is a steep bank some ten feet high up to rolling land where private residences are built (on lots of perhaps an acre each) along Forest Pines Road. The stream at this point gives no sign that it has descended on one branch down a mountainside through a scenic cascades area, and on another branch from a bog and past a cemetery. It appears to be just an ordinary and rather lazy stream. On the steep east shore, roots from two large pines and several smaller red maples grow over stream edge boulders and extend into the water which actively undercuts the stream bank trees. The (mostly deciduous) canopy of red maple, beech, and pines of several varieties shade the stream quite thoroughly at the test site. The understory trees include spruce, fir, hemlock, ash, witch hazel, and scrub oak. On the sandy banks grow mosses, ferns, asters and other wildflowers, poison ivy, Canada mayflowers, and other herbaceous plants. Only two pieces of litter were anywhere in sight at the time of writing this description. The site is impacted by Route 113 (see above), the Silver Lake Home Center parking lot, and the residence to the east; nevertheless, the water seems pristine - a Great Blue Heron was fishing during our observations, so apparently heron food thrives in the water. Eight meters downstream from the site, on the east side, a large water/sewer concrete construction rears up ten feet above the stream. Finally, in the late 1950s or early 1960s, when a late spring snowstorm melted rapidly, this section of Forrest Brook rose

six feet above the road in this low, floodplain area. This site was chosen as it is located in the center of Madison within the Ossipee Watershed and is located near two drinking water protection zones.

GM-4 Ferrin Brook, Route 153, Madison (pilot site in 2013)

This site is located just downstream of NH153. Significant amounts of stormwater are shed off of the wide sandy shoulder of NH153 directly into Ferrin Brook, which flows into the south end of Purity Lake. This stream is lower volume than the others, but may transport more NPS pollution.

GM-5 Mill Brook, Route 153, Madison (pilot site in 2013)

This site is located about 600 feet south of where Route 153 passes over the outflow of Purity Lake. This site was added to better understand phosphorus concentrations within the Danforth Pond Watershed.

GO-1 Beech River, Tuftonboro Road, Ossipee

Biweekly (Apr-Oct) 2002-2012

Monthly (Winter) 2004-2012

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. As with most sites in the Ossipee Watershed, water at this site was slightly acidic. Dissolved oxygen levels have at times fallen below state standards. Dissolved Organic Nitrogen dominates Dissolved Inorganic Nitrogen at this site, and total phosphorus, sodium and chloride levels remained mostly below natural background levels for New Hampshire surface waters. On a few occasions in the summer months, sodium and chloride levels at this site were higher than typical background levels of NH surface waters. Conductivity levels remain below natural background levels and appear to have remained stable over the sampling period, and turbidity levels slightly decreased. This site continues to show one of the highest silica levels in the watershed, indicating groundwater input. Macroinvertebrate sampling results from 2006 through 2010 suggest the Beech River contains a macroinvertebrate community indicative of a stream in good to excellent condition.

The Beech River flows from Melvin Pond and Garland Pond in the southern Ossipee Mountains, along the Tuftonboro Road, and into the Pine River. The sampling location is where the river flows underneath the Tuftonboro Road. The stream is approximately 15 feet wide and 1-2 feet deep with a rocky substrate. The stream has a medium flow at the site and is clear with some foam/bubbles on top. There is a large beaver dam upstream of the bridge. Deciduous trees surround the site, including maple, oak, and ash with some hemlock and pine. Towards the end of the summer and into fall there is a thick shrub layer of golden rod, Queen Anne's lace, and aster. This site was chosen because of accessibility and because it is located upstream of a mill, dump and old tannery.

GO-2 Frenchman Brook, White Pond Road, Ossipee

Biweekly (Apr-Oct) 2002-2012

This site is located about a 1/2 mile down White Pond Road just off Granite Road in the section of Ossipee known as Granite. White Pond Rd is a dirt road, maintained by the town. The site is approximately 40 feet upstream of where the stream crosses under White Pond Rd. There is a small pull-off below the brook and across the road is a barely discernible path that leads to a very small clearing on the bank where we do our testing. It is a quiet, apparently rarely visited site, except perhaps by deer and raccoon. At the site, the brook is narrow, about 5 feet across and curves both above and below the test area. The brook runs moderately fast with ripples in the center, and generally calm on the sides. The center of the brook is approximately 1 foot deep. There is a smaller brook that joins Frenchman's brook directly across from the test site. The bottom is silty with a deposit of dark colored pebbles in mid-stream. There are a couple of large dead branches in the brook downstream from the testing site. There is a moderate amount of organic debris (pine needles, leaves, ect.) near the edges of the brook; however, there are no aquatic plants. In general, the land from which we

test is stable, although one week when we tested during a heavy rain event we noted a lot of disturbance when we stepped close to the edge of the brook. There is a large hemlock sheltering our test site. Other plants in the area include several types of fern (Royal, Sensitive, and Wood fern among them). The surrounding woods are mostly alder, mixed hardwood with a lot of maple samplings and pine. The topography surrounding the brook is mostly flat. Frenchman's Brook flows from Polly's Crossing, through a gravel pit, and into White Pond. This site was chosen because Frenchman Brook runs under Route 16 just upstream of the test site, and there is the potential for road run-off impact. In addition, dumping has previously occurred upstream.

GO-3 Frenchman Brook, Polly's Crossing, Ossipee.

Biweekly (May-Oct) 2003

This site did not experience the elevated nutrient levels as the downstream GO-2 site saw in 2002 and 2003. This site was discontinued due to intermittent flow and dry conditions during the summer months.

GO-3 is located in Polly's Crossing immediately downstream of a wetland. Sampling occurred where the stream flowed out of a culvert under a Class VI road. An upland forest surrounds the site. The stream is narrow and experiences intermittent flow during the drier months of the summer. This site was chosen because of concern over high nutrient levels seen at GO-2 in 2002 that suggest a disturbance is occurring upstream. This site will help pinpoint the source of the disturbance.

GO-4 Bearcamp River, UNH property, Newman Drew Rd., West Ossipee.

Biweekly (Apr-Oct) 2004-2012

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. Total phosphorus, conductivity, sodium and chloride levels remained below natural background levels for New Hampshire surface waters, although conductivity levels appear to have increased slightly over the sampling period, as did turbidity levels. Mean dissolved inorganic nitrogen approached the level of dissolved organic nitrogen at this site, indicating some impairing inputs. Nitrate concentrations at this site and a site farther downstream (OL-2) were also slightly higher than nitrate levels observed at upstream sites (GT-1, GO-5), however, nitrate levels overall were relatively low (below .15 mg NO₃-N/L). Higher silica levels at this site indicated a significant amount of groundwater input.

GO-4 is located on UNH property off of Newman Drew Rd. The site is accessed, however, from the Whit's End Campground land. Upstream from the site, the river makes a sharp right bend. The site is located on a small beach after this bend. There are often deer tracks along this beach, along with occasional moose and beaver tracks. The bottom is mostly sand with some gravel at the site with some large fallen trees in the water. The water is moderately fast moving, moving more swiftly than other Bearcamp River sites, and is about 0.5 – 2 feet deep, depending on rain fall and positioning in river due to an uneven and often changing bottom. Pine is the dominant tree here, along with some silver maples.

GO-5 Bearcamp River, Whittier Bridge, West Ossipee.

Biweekly (Apr-Oct) 2004-2012

Monthly (Winter) 2004-2012

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. Total phosphorus, conductivity, sodium and chloride levels remained below natural background levels for New Hampshire surface waters, although total phosphorus levels were elevated on one occasion in 2007. Conductivity levels appear to have remained stable over the sampling period, while turbidity levels slightly increased. Dissolved Inorganic nitrogen dominated Dissolved Organic Nitrogen, indicating some impairing inputs. Nitrate concentrations at this site and sites farther downstream (OL-2 & GO-4) were also slightly higher than nitrate levels observed at the upstream sites (GT-1), however, nitrate levels overall were relatively low (below .15 mg NO₃-N/L). This site has experienced high levels of silica, indicating a significant amount of groundwater input.

GO-5 is located on the Bearcamp River in West Ossipee. The Bearcamp River flows from the Sandwich Range into Bearcamp Pond. Then it drains Bearcamp Pond and flows through along Rt. 25 in Tamworth

until it flows into Ossipee Lake in Ossipee. The site is just below the Whittier Covered Bridge on Whittier Bridge Rd. GO-5 is approximately 2.5 - 3 river miles upstream from GO-4. Just downstream the river makes a horseshoe bend pointing north. The river is moderately fast moving here, but slow enough so that this is a popular swimming hole in the summer. The bottom is sandy and there is about a 100 foot wide beach on the north side of the stream where we test, another reason why this is such a popular swimming place. The river is about 30-35 feet wide and towards the middle the river is about 3-4 feet deep, depending on rainfall. There are no aquatic plants due to the sandy nature of the bottom. The surrounding forest is a mixed deciduous forest with some pine.

**GO-6 Beech River, Route 16, Ossipee
(pilot site 2005-2006)**

Random testing at this pilot site through 2006 was conducted at this site based on a request from town officials who thought potential impairing inputs from an old mill and tannery could be affecting the stream. Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards.

**GS-1 Cold River, Route 113, Sandwich.
Biweekly (Apr-Oct) 2002-2012
Monthly (Winter) 2004-2012**

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. Total phosphorus, conductivity, sodium and chloride levels remained well below natural background levels for New Hampshire surface waters, and Dissolved Organic Nitrogen slightly dominates Dissolved Inorganic Nitrogen at this site. Aside from one slightly elevated phosphate reading in 2005, this site continued to demonstrate the lowest temperatures, nutrient concentrations and salts in the watershed. GS-1 serves as a minimally impacted reference site for the rest of the Ossipee Watershed. In 2006, 2007, 2008, and 2010 sampling just upstream from the site showed the macroinvertebrate community was indicative of a stream with 'excellent' water quality, while in 2009 the water quality score was 'good'.

GS-1 is located where the Cold River passes under Route 113 in Sandwich near the Tamworth/Sandwich town line. Cold River drains several streams that flow out of the White Mountain National Forest and the Sandwich Range Wilderness including Flat Mountain Pond. The river is about ten meters wide. GS-1 is downstream from a riffle and has a rocky substrate. The river stands up for its name as this site is usually the coldest in the WQM program. There is dense riparian vegetation on one side of the river and an upland deciduous forest on the other. This test site was chosen because of concerns about the gravel pit located upstream of the test site and because the river is situated upstream of Tamworth's drinking wellhead zone.

**GT-1 Bearcamp River, Route 113, Tamworth.
Biweekly (Apr-Oct) 2002-2012**

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. Total phosphorus, conductivity, sodium and chloride levels remained well below natural background levels for New Hampshire surface waters. There was only one occasion in 2005 when chloride levels rose above natural background levels. As with most sites in the Ossipee Watershed, water at this site was slightly acidic, and this particular site's pH was almost always below state standards. Dissolved oxygen levels occasionally dipped below state standards, but the mean was within an acceptable range. The tea stain in the water and the low dissolved oxygen and pH could be a factor of the several wetlands that the Bearcamp winds through before passing by GT-1; however, if this is the case, the DOC and DON concentrations are surprisingly low as well. Dissolved Organic Nitrogen dominates Dissolved Inorganic Nitrogen at this site. Nitrate concentrations at this site were lower than nitrate levels observed at the downstream sites (GO-5, GO-4, and OL-2), and nitrate levels overall were relatively low (below .15 mg NO₃-N/L). The macroinvertebrate community in the Bearcamp River at a site downstream from GT-1 in 2006, 2008, 2009 and 2010 was indicative of a stream with 'good' water quality.

The site is located under the bridge where Rout 113 crosses the Bearcamp in South Tamworth near the Community School. The Bearcamp drains several streams that flow from Mount Israel in Sandwich. At the

sampling site, the Bearcamp is a straight stretch of slow moving tea stained water. The river is 50-60 feet wide with a sandy bottom with scattered cobble and boulder sized rocks. It is about four feet deep at its deepest spot during summer median water level. There is no forest canopy directly at the sampling site and it receives full sunlight with the exception of the portion under the bridge. There are red maples growing about 100 feet on either side of the bridge offering partial shade for much of the river. This site was chosen because of accessibility and because it provided a way for the students at The Community School to get involved with water testing. This site is located downstream of Tamworth's drinking water supply zone.

GT-2 Mill Brook, Earle Remick Natural Area, Tamworth.

Biweekly (Apr-Oct) 2002-2003

DIN dominated TDN at this site in 2003, while the site upstream GT-3 did not, indicating that the source of impairment occurs between GT-2 and GT-3. In 2002 and 2003, this site experienced the highest mean concentration of ammonium measured thus far for sites in the watershed. This site was discontinued because NH DES has monitoring wells nearby to monitor the capped landfill for nutrients and other chemicals.

This sampling site is located within the Earle Remick Natural Area. The Mill Brook flows from the White Mountain National Forest and the Sandwich Range Wilderness and past the recently-capped Tamworth landfill. The site is set amongst a hemlock forest. The stream is about five meters wide and is swift moving with a rocky substrate. This test site was chosen because Tamworth's recently closed dump is located upstream and because established and well-maintained trails provide accessibility.

GT-3 Mill Brook, Durrell Road, Tamworth.

Biweekly (Apr-Oct) 2003

This site is listed as "impaired" due to lower pH levels that could harm aquatic life. This site had elevated levels of DOC, indicating the presence of more organic matter and decomposition at the site. Water color was tea-stained, and unlike downstream site GT-2, this site did not experience the same DIN domination or low pH. This site was discontinued because NH DES has monitoring wells nearby to monitor the capped landfill for nutrients and other chemicals.

The site is located about one mile down Durrell Road on the North side of the road. The sampling site is on a straight stretch of stream with a steep slope leading down from the road and a relatively flat area on the opposite bank. Forest cover is dominated by eastern hemlock providing ample shade at the sampling site. The stream is straight, about 25-30 feet wide at the site and rather shallow: about 1-1.5 feet at its deepest point. It is about three to six inches deep where I sample. The bottom is dominated by sand and gravel with lots of cobble and bolder sized rocks scattered about. This site was chosen because of high nutrient levels seen at the downstream site (GT-2) in 2002 that suggests a disturbance has occurred up stream. Testing here will help pinpoint the source of this disturbance.

GT-4 Chocorua River, RT. 41, Tamworth.

Biweekly (Apr-Oct) 2004-2012

Monthly (Winter) 2004-2012

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. Total phosphorus, conductivity, sodium and chloride levels remained below natural background levels for New Hampshire surface waters, although conductivity and turbidity levels appear to be increasing slightly over time and conductivity was elevated above natural background levels on one occasion in 2008. DIN concentrations dominated DON, and this site continued to have one of the higher mean nitrate concentrations measured across the watershed, although levels were relatively low overall (<.32 mg NO₃-N/L).

From its source high on Mt. Chocorua, the Chocorua River drains the southeast side of the mountain. Just north of Lake Chocorua, the river's waters commingle with those of Stony Brook, Meadow Brook and their network of tributaries which drain the southern flanks of the mountain. Together, they enter the northern end of Lake Chocorua and eventually exit to the south under the landmark bridge and into adjacent Little Lake. From there they trace a long, slow, inverted "S" to Chocorua Village and pool before spilling over the

dam, passing under Routes 113 and 16 and flowing south, contributing to the large marsh which runs along the east side of Route 16 from Chocorua to Moores Pond. From Moores Pond the river flows 2-1/2 miles through large stretches of marsh and finally emerges and passes under Route 41 at the Tamworth/West Ossipee line and just west of the Madison line. Monitoring Site GT#4 is at that bridge. A short distance from the site, the Chocorua River joins the Bearcamp River and flows into Ossipee Lake.

The Chocorua River's course from source waters on the mountain to the Bearcamp River and Ossipee Lake points to the importance of this relatively new sampling site; GT#4. It serves to monitor occurrences along a seven miles stretch of the busiest and most diversely utilized highway in our area, including locally cherished, pristine Lake Chocorua; and it feeds Ossipee Lake.

Site GT-4 itself is a bit precarious. The sampler must affect a straddle with one foot on a log butt and the other on a projection at the base of a 21 foot long steel retaining wall which is part of the bridge. Photo A shows Jennifer preparing the equipment at the site. The actual steel-based bridge is preceded by 20 to 30 feet of 8-foot steel walls on either side. These can be seen in photo B. To stabilize the embankment along the east side, large granite slabs are laid lengthwise along the final 15 feet up to the steel wall as shown in photo C. The slabs and steel walls channel the river around a 45 degree bend to its passage through the 18 foot bridge opening and under the roadway as shown in photo D. The river exits around an opposite 45 degree bend on the other side. The roadway is protected on both sides by guard rails, a powerline runs overhead; and there is a red dry hydrant at the top of the short path to the site. See photo E.

The river is 8 to 12 feet wide in the area of the sampling site with a consistent, gentle flow with more ripples and surface effect at the site itself due to its location on the far side of the bend. The lower right corner of photo F shows the actual site. About 3 to 5 feet deep in the center, the river appears to fluctuate 12 to 18 inches as indicated by the water lines on the walls. The water is clear and free from any odor. As depicted in photo G, the bottom at the site is sand interspersed with stones and rocks and some scattered woody debris, with a tinge of rust presumably from the steel walls. About 6 feet downstream, beyond the bend and the current, there are patches of green algae on more stable sand covered with a thin layer of brown sediment. Due the flow pattern, the east side differs significantly with green and brown algae, as shown in photo H, and more grasses and accumulated woody debris in general on that side. About 40 feet upstream from the site, intermittent tree falls interrupt the flow and capture small amounts of debris, in one area creating a small waterfall as shown in photo I.

The site is bordered on the east by Route 41 and on the west by mixed young forest dominated by 3" to 10" diameter maples, some white oak and some small white pines. The dominant tree is a healthy, 24" diameter white oak. The lower story is dense with mixed grasses and ferns, mostly royal fern. In the immediate area of the sampling site where the substrate is coarse and uneven, obviously affected by the bridge construction, sweet fern, coarse grasses, a few birch saplings and goldenrod have taken hold.

The active truck and morning travel on Route 41 notwithstanding, site GT-4 is a pleasant place to be early on a summer morning.

GT-5 Swift River, Tamworth Village, Tamworth.

Biweekly (Apr-Oct) 2005-2012

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. Total phosphorus, conductivity, sodium and chloride levels remained below natural background levels for New Hampshire surface waters. Conductivity levels appear to be stable while turbidity levels increased slightly over the sampling period. DIN dominated DON concentrations at this site, although TDN levels were low overall. This site had the lowest mean DOC concentrations in the watershed. In 2006 and 2009 the macroinvertebrate community was indicative of a stream with 'fairly poor' water quality. However, the data may reflect a bias towards the selection of black fly larvae, driving up the biotic score. Sampling in 2007 and 2008 showed 'good' and 'excellent' water quality, respectively, based on the communities found.

This site was added in 2005 to the monitoring program at the suggestion of town officials at a Selectmen meeting in the spring of 2005. The site is in the center of the village, downstream from new development and is easily accessible.

OL-1 West Branch River, Ossipee

Summer (Biweekly) 2003-2004

In 2003 and 2004, with low turbidity and nutrients and high dissolved oxygen and neutral pH, this site exhibited good water quality, although it is listed as "impaired" due to lower pH levels that could harm aquatic life.

OL-1u West Branch River, Ossipee Lake Road, Ossipee

Summer (Biweekly) 2005-2012

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. Total phosphorus, conductivity, sodium and chloride levels remained below natural background levels for New Hampshire surface waters, although chloride levels have approached minimum background levels on a number of occasions. Conductivity and turbidity levels appear to have increased slightly over the sampling period. DIN concentrations dominated DON, and mean nitrate levels were one of the highest of all sites, although below .34 mg NO₃-N/L. Dissolved oxygen levels also fell below state standards occasionally.

OL-2 Bearcamp River

Summer (Biweekly) 2003-2012

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. Low turbidity, nutrient and salt levels and high dissolved oxygen have been observed at this site. Dissolved Organic Nitrogen dominates Dissolved Inorganic Nitrogen at this site. Total phosphorus, conductivity, sodium and chloride levels remained below natural background levels for New Hampshire surface waters.

Conductivity levels appear to have remained stable while turbidity levels appear to have increased slightly over the sampling period. This site exhibited higher temperatures than other sites, most likely due to the influence of warmer lake waters.

OL-3 Patch Pond Point River

Summer (Biweekly) 2003-2004

This site experienced elevated levels of calcium in 2003 and 2004 which were higher than calcium levels at most other sites in the watershed. This may be from a natural source and future sampling will determine if this is an ongoing occurrence. This site was discontinued in 2005 due to the lack of an upstream access point. This site could be sampled in the future from a small watercraft.

OL-4 Lovell River, outlet to lake

Summer (Biweekly) 2003-2004

This site exhibited good water quality in both 2003 and 2004. This site was moved upstream in 2005 to OL-4u to eliminate the influence of lake water.

OL-4u Lovell River, Route 16, Ossipee

Summer (Biweekly) 2005-2012

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. This site had some of the lowest concentrations of sodium, chloride, calcium, potassium and magnesium of all sites. Likewise, conductivity levels were low over the sampling period. Dissolved oxygen is typically high, and pH tends to be low. While total phosphorus levels were some of the lowest in the watershed and total dissolved nitrogen levels were also low, DIN is almost equal to DON, with nitrate concentrations accounting for the majority of DIN. Biomonitoring in 2006 suggested the macroinvertebrate community composition was indicative of a site with 'fairly poor' water quality. However, the data may reflect

a bias towards the selection of more visible black fly larvae. Sampling in 2007-2010 showed ‘excellent’ and ‘good’ water quality conditions from year to year.

OL-5 Weetamoe Brook, outlet to lake

Summer (Biweekly) 2003-2004

This site exhibited good water quality in 2003 and 2004 with low turbidity and nutrients and high dissolved oxygen and neutral pH readings. At the recommendation of UNH water quality experts, in 2005 this site was moved upstream to OL-5u to ensure lake water would not influence samples and data.

OL-5u Weetamoe Brook, Weetamoe Road, Ossipee

Summer (Biweekly) 2005

Total phosphorus, conductivity, sodium and chloride levels remained below natural background levels for New Hampshire surface waters, except on one occasion in 2007 when total phosphorus levels were higher than natural background levels. This site exhibited one of the highest mean turbidity levels in the watershed, most likely due to lower flow and water stagnation. This site also had one of the lowest mean dissolved oxygen levels, with concentrations consistently below state standards, and some of the lowest pH readings in the watershed. Total phosphorus concentrations were at times elevated when compared with other sites in the watershed. The site was discontinued in 2005 in an effort to find more reliable flow upstream at site OL-5ua.

OL-5ua Weetamoe Brook, Weetamoe Road, Ossipee

Summer (Biweekly) 2006-2012

Conductivity, sodium and chloride levels remained below natural background levels for New Hampshire surface waters. This site exhibited similarly high mean turbidity levels to the downstream site OL-5u, again, most likely due to lower flow and water stagnation. This site also had one of the lowest mean dissolved oxygen levels, with concentrations consistently below state standards, and some of the lowest pH readings in the watershed. Total phosphorus concentrations were often elevated when compared with other sites in the watershed, and rose above natural background levels on multiple occasions. Efforts will continue on this brook to find a suitable monitoring site with reliable flow to determine whether or not water quality at this site is due to natural conditions, or to determine if causes to low flows are natural or anthropogenic, such as a high-placed culvert.

OL-6 Pine River

Summer (Biweekly) 2003-2006

This site is at the Pine River mouth. Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. Conductivity, sodium and chloride levels remained below natural background levels for New Hampshire surface waters. Dissolved oxygen levels dipped below state standards occasionally. Nutrient and salt levels were similar to upstream site GE-1, with mean silica levels also higher than most other sites, indicating groundwater input.

OL-6u Pine River (pilot site 2013)

This site is located on Hodson Road in Ossipee. Significant transportation and recreational land uses are just upstream, as is a very large wetland. This site would help to characterize the entire flow of the Pine River watershed into Ossipee Lake

OL-7 Red Brook

Summer (Biweekly) 2003-2008

Biweekly (Apr-Oct) 2009-2012

OL-7 continued to exhibit many traits of a wetland system: low dissolved oxygen and pH and high nitrogen, phosphate, total phosphorus, and dissolved organic carbon. Indeed, this site drains a large shrub-dominated wetland. While the site has some of the highest mean levels of nutrients, it has the lowest mean silica and sulfate levels in the watershed. Dissolved Organic Nitrogen dominated Dissolved Inorganic Nitrogen at this site, with this site showing some of the highest levels of ammonium in the watershed. Preliminary analysis of

data from 2003 to 2008 shows an increasing trend in phosphate and a variable trend in dissolved organic carbon. A site upstream of this wetland would determine the quality of the water as it comes into the wetland. A comparison of the water quality upstream and downstream of the wetlands could determine the functionality of this area. GE-4 was initially selected as the upstream bracketing site, however, this site's restricted flow does not allow for regular testing. This stream enters the lake just to the east of OLNA. The sense (from what I hear) is that currents typically move down to the Ossipee River from there (through the bays), so not sure that water has much of an influence on OLNA beach area. Since 2009, this site has been monitored on a monthly basis in the RIVERS program.

OL-9 Cold Brook, outlet to lake

Summer (Biweekly) 2003-2004

This site exhibited high levels of both total phosphorus and phosphate in 2003. However, in 2004, total phosphorus and phosphate were low relative to other OLT sites. In addition, this site showed good water quality with low turbidity and nutrients and high dissolved oxygen. This site was moved upstream in 2005 to eliminate the influence of lake water.

OL-9u Cold Brook, Alvino Road, Freedom

Summer (Biweekly) 2005-2012

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. Conductivity, sodium and chloride levels remained below natural background levels for New Hampshire surface waters. Turbidity and conductivity levels slightly decreased over the sampling period. Dissolved Inorganic Nitrogen dominated Dissolved Organic Nitrogen, however, nitrogen levels were relatively low, with nitrate being the primary component and levels falling below .17 mg NO₃-N/L.

OL-10 Huckins Pond Outflow

Summer (Biweekly) 2003-2007, 2012

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. This site continued to show higher temperatures when compared with other watershed sites, most likely due to lake water influence. Overall, the site exhibited low turbidity, conductivity, nutrients and salts. In the future, moving this site upstream will yield data more representative of the tributary's water quality since it appears that lake waters are influencing samples. This site was picked up again in 2012 due to a focus on the upper GF-1 subwatershed and interest in understating potential impacts from the wetland, horse farm, campground, and ski area.

OL-11 Danforth Brook, outlet of Lower Danforth Pond (Same as GF-1)

Summer (Biweekly) 2003-2004

This site is listed as "impaired" due to lower pH levels that could harm aquatic life. Turbidity and nutrients were low, dissolved oxygen was high, and the pH was neutral. This site was discontinued as a tributary site since it was already being monitored as RIVERS site GF-1.

OL-12 Phillips Brook, outlet to Leavitt Bay

Summer (Biweekly) 2003-2004

This site is listed as "impaired" due to lower pH levels that could harm aquatic life. A new infestation of variable milfoil was found at this site in 2003. Since the milfoil was discovered it has been treated with herbicides and mats; however, the milfoil still exists in the brook. In 2004, this site showed elevated levels of dissolved organic carbon, sodium and chloride relative to other OLT sites. This site was moved upstream to be sampled by the road when the campers could not sample. This could explain the difference in sodium and chloride as the water is more influenced by road salt application. This site was moved permanently upstream in 2005 to OL-12u.

OL-12u Phillips Brook, Remle Road, Effingham

Summer (Biweekly) 2005-2008

Biweekly (Apr-Oct) 2009-2012

Winter (Monthly) 2009-2012

This site exhibited signs of impairment based on data from the sampling period. Monitoring through 2008 showed some of the highest conductivity readings and turbidity readings in the watershed, with conductivity levels variable over the sampling period. This site also had the highest mean sodium and chloride levels observed for the watershed due to road salting of Route 25 and other small roads in the watershed. Dissolved Inorganic Nitrogen dominated Dissolved Organic Nitrogen, however, nitrogen levels were relatively low, with nitrate being the primary component and levels falling below .33 mg NO₃-N/L. Mean dissolved oxygen and pH levels were below state standards. Calcium, magnesium and potassium levels were slightly elevated as well. One particular incident with road work just upstream on Route 25 in 2005 led to a spike in turbidity and total phosphorus. Continued monitoring and spring testing at this site may help determine if these conditions persist, but the recommendation is to look into reduced salting and/or road salt alternatives near this site. Since 2009, this site has been monitored on a monthly basis, including during winter months. This site is influenced but episodic flooding and draining due to upstream and downstream beaver dam activity and the regular removal of the dams.

**OL-13 Leavitt Brook, Camp Marist property, Effingham
Summer (Biweekly) 2003-2012**

Mean levels for all parameters except for pH were within the acceptable range for surface waters according to state standards. Conductivity, total phosphorus, sodium and chloride levels remained below natural background levels for New Hampshire surface waters, although in 2005 conductivity levels were slightly above natural background levels on a few occasions. While conductivity levels appeared to decrease slightly over the sampling period, turbidity levels increased. Dissolved Organic Nitrogen dominated Dissolved Inorganic Nitrogen at this site. This site consistently showed elevated levels of silica, indicating that this site is groundwater fed.

**OL-14 Square Brook, outlet at Broad Bay, Freedom
Summer (Biweekly) 2003-2004**

In 2003, with low turbidity and nutrients and high dissolved oxygen and pH, this site exhibited good water quality, although it is listed as "impaired" due to lower pH levels that could harm aquatic life. In 2004, this site exhibited high turbidity, dissolved inorganic nitrogen, sodium, chloride, potassium, calcium, and magnesium, indicating impairment. This site also exhibited high levels of silica suggesting that it is groundwater fed. The difference between the two years may be explained by a change in sampling location further upstream from the lake and closer to Ossipee Lake Road. This site was moved permanently upstream in 2005 to site OL-14u.

**OL-14u Square Brook, Ossipee Lake Road, Freedom
Summer (Biweekly) 2005-2008
Biweekly (Apr-Oct) 2009-2012
Winter (Monthly) 2009-2012**

As with other sites in the watershed, mean pH levels were below state standards. Monitoring through 2008 showed consistently elevated conductivity readings, indicating impact from human activities. Magnesium, calcium, potassium, sodium and chloride were all slightly elevated at this site when compared with other sites in the watershed. Chloride was regularly above typical background levels for NH's surface waters in 2005 and again in 2008. Total Dissolved Nitrogen was also elevated, with Dissolved Inorganic Nitrogen dominating TDN at a higher percentage than most sites, however, nitrogen levels were relatively low, with nitrate being the primary component and levels falling below .36 mg NO₃-N/L. Since 2009, this site has been monitored on a monthly basis, including during winter months.