Hubbard Brook Metadata Report
(HBR)

West Thornton, New Hampshire

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on Wed Dec 10 06:06:34 2008

Research Area Information

Hubbard Brook

Research Area Information

Harvest URL - Option 1

http://www.hbrook.sr.unh.edu/climdb/hbr_climdb.txt

Harvest URL -Option 2

http://www.hubbardbrook.org/research/hydrodb/hbr_hydro.txt

Site URL

http://www.hubbardbrook.org/

Site north bounding coordinate (decimal degree) 43.96226

Site west bounding coordinate (decimal degree) .....-71.68641

Site south bounding coordinate (decimal degree) 43.91596

Site east bounding coordinate (decimal degree) .....-71.80492

Site Climate URL

http://www.hbrook.sr.unh.edu/data/data.htm

Site Watershed URL

www.hbrook.sr.unh.edu/overview/hbguidebook.htm

Site Map URL

www.hbrook.sr.unh.edu/descript/descript.htm

Experimental Design

Experimental manipulation is a research approach that has been used extensively at Hubbard Brook. A number of whole watershed (Table 2), stream and lake manipulations have been conducted to test research hypotheses, obtain quantitative information on pertinent environmental issues and to validate process-related formulations used in simulation models. Whole ecosystem manipulations conducted at Hubbard Brook include: 1. Watershed Manipulations W2 The first of the HBEF manipulations was undertaken to evaluate the role of forest vegetation in regulating the hydrologic and element output of a northern hardwood forest watershed (Figure 11). In December 1965, all trees, shrubs and woody vegetation were cut with chain saw on watershed 2 (15.6 ha) and left on the ground. The forest floor was virtually undisturbed, since the trees were felled on a snow surface of about 50 cm, no products were removed and no vehicles were allowed in the area. Bromacil, a non-specific woody herbicide, was broadcast sprayed over the watershed by helicopter in June 1966 to kill regrowth. For the next two summers, 2,4,5-T was sprayed from the ground on the persistent regrowing vegetation with backpack mist blowers. Beginning in 1969, vegetation was allowed to regrow (Likens et al. 1970; Nodvin et al. 1988; Reiners 1992). W4 The next watershed manipulation was conducted to assess the effects of strip cutting on water yield and nutrient input-output budgets.

Watershed 4 was divided into 49 east-west strips (almost following topographic contours) 25 m wide. In the autumn of 1970, every third strip was cut. The second series of strips was cut in 1972, leaving one series of strips uncut. Finally in 1974, the last set of strips was cut. Except for a variable width buffer of trees that was left along the main stream channel, the entire watershed was clear-cut in these three phases. All trees to a minimum of 5 cm were felled, and all products of value to the logging contractor were removed by rubber-tired skidder. Dense natural regrowth is occurring. Generally, regrowth of vegetation in northern hardwood stands in the area is profuse (Hornbeck et al. 1987). W101 Watershed 101 (12.1 ha and ungaged) was clear-cut as a block in the autumn of 1970 along with W4 to compare the block cutting with strip cutting. All trees to a minimum of 5 cm were cut and all merchantable products removed by the same operator who cut W4. Rubber-tire skidders were used to remove the stems. W5 This watershed manipulation was designed to assess the effects of a commercial whole-tree harvest on nutrient cycles. Watershed 5 (21.9 ha) was whole-tree clear-cut during the autumn of 1983 through the spring of 1984. All trees larger than 10 cm in diameter at breast height were harvested by removal of whole trees (bole and tops) using a feller-buncher machine on accessible slopes and chain saws on steep inaccessible slopes. Trees were removed, unlimbed, using skidders (Fahey et al. 1988; Johnson et al. 1991a,b; Dahlgren and Driscoll 1994). W1 In November 1999, wollastonite (CaSiO3), pelletized with a 4% lignosulfonate binder, was applied by helicopter in a effort to replace the calcium that has been depleted from soil over the last 50 years due to inputs of acid rain. Forty-five tons of wollastonite (1.2 tonnes/ha) were added to W1 to increase the base saturation of soil from approximately 10% to 19%. The added wollastonite has a distinctive calcium to strontium ratio and strontium stable isotope ratio which will enable us to track the fate of the added material 2. Stream Manipulations Reaches of several tributary streams at the HBEF have been chemically or physically manipulated in an intensive series of experiments. These treatments include additions of HCl, H2SO4, AlCl3, KH2PO4, NH4Cl, KNO3, sucrose and leaf leachate, debris dam manipulations and artificial lighting (e.g. Meyer 1989; Bilby and Likens 1980; Hall et al. 1980, 1985; Meyer et al. 1981; Richey et al. 1985; McDowell 1985; Hedin et al. 1990).

Publications

www.hbrook.sr.unh.edu/pubs/hbrbib.htm

USGS Harvest URL

http://gce-lter.marsci.uga.edu/harvest/usgs/hbr_lter.txt

Meteorlogical Stations

Weather Station 1

Air Temperature

Begin Date..... 19551020
Data Logger Sampling Interval..... continuous
Summary Interval ..... continuous
Data Accuracy (degree celsius) ..... .6 C
Instrument Height (meters) 1.2
Instrumentation Description

Belfort Hygrothermograph Cat. No. 594 strip chart recording instrument

Weather Station 14

Air Temperature

Begin Date..... 19650101
Data Logger Sampling Interval..... continuous
Summary Interval ..... continuous
Data Accuracy (degree celsius) ..... .6 C
Instrument Height (meters) 1.2
Instrumentation Description

Belfort Hygrothermograph Cat. No. 594 strip chart recording instrument

Weather Station 17

Air Temperature

Begin Date..... 19990101
Data Logger Sampling Interval..... continuous
Summary Interval ..... continuous
Data Accuracy (degree celsius) ..... .6 C
Instrument Height (meters) 1.2

Instrumentation Description

Belfort Hygrothermograph Cat. No. 594 strip chart recording instrument

Weather Station 1A

Air Temperature

Begin Date..... 19580101
Data Logger Sampling Interval..... continuous
Summary Interval ..... continuous
Data Accuracy (degree celsius) ..... .6 C
Instrument Height (meters) 1.2
Instrumentation Description

Belfort Hygrothermograph Cat. No. 594 strip chart recording instrument

Weather Station 23

Air Temperature

Begin Date..... 19950901
Data Logger Sampling Interval..... continuous
Summary Interval ..... continuous
Data Accuracy (degree celsius) ..... .6 C
Instrument Height (meters) 1.2
Instrumentation Description

Belfort Hygrothermograph Cat. No. 594 strip chart recording instrument

Weather Station 24

Air Temperature

Begin Date..... 19990101
Data Logger Sampling Interval..... continuous
Summary Interval ..... continuous

Data Accuracy (degree celsius) ..... .6 C
Instrument Height (meters) 1.2
Instrumentation Description

Belfort Hygrothermograph Cat. No. 594 strip chart recording instrument

Weather Station 6

Air Temperature

Begin Date..... 19610101
Data Logger Sampling Interval..... continuous
Summary Interval ..... continuous
Data Accuracy (degree celsius) ..... .6 C
Instrument Height (meters) 1.2
Instrumentation Description

Belfort Hygrothermograph Cat. No. 594 strip chart recording instrument

Weather Station HQ

Air Temperature

Begin Date..... 19570101
Data Logger Sampling Interval..... continuous
Summary Interval ..... continuous
Data Accuracy (degree celsius) ..... .6 C
Instrument Height (meters) 1.2
Instrumentation Description

Belfort Hygrothermograph Cat. No. 594 strip chart recording instrument

Watershed 1 Precipitation

Precipitation

Begin Date..... 19560101

Data Logger Sampling Interval..... continuous

Summary Interval ..... daily

Instrumentation Description

Belfort Weighing Rain Gage Cat. No. 5-780 Belfort Non-Recording Rain Gage Cat. No. 5-400

Methods Description

Hubbard Brook precipitation is collected through a series of 25 standard rain gages and 7 recording rain gages scattered among the 9 gaged watersheds. Each standard gage is prorated by one of the recording gages. A theissen weighting method is applied to the prorated standard gages to calculate a daily watershed precipitation total. Daily watershed precip is the sum of each daily standard gage precip X theissen weight for that standard gage. theissen weights for WS1: standard gage 1 - .10 standard gage 2 - .46 standard gage 3 - .44

Watershed 2 Precipitation

Precipitation

Begin Date..... 19570101

Data Logger Sampling Interval..... continuous

Summary Interval ..... daily

Instrumentation Description

Belfort Weighing Rain Gage Cat. No. 5-780 Belfort Non-Recording Rain Gage Cat. No. 5-400

Methods Description

Hubbard Brook precipitation is collected through a series of 25 standard rain gages and 7 recording rain gages scattered among the 9 gaged watersheds. Each standard gage is prorated by one of the recording gages. A theissen weighting method is applied to the prorated standard gages to calculate a daily watershed precipitation total. Daily watershed precip is the sum of each daily standard gage precip X theissen weight for that standard gage. theissen weights for WS2: standard gage 1 - .02 standard gage 2 - .41 standard gage 3 - .57

Watershed 3 Precipitation

Precipitation

Begin Date..... 19580101

Data Logger Sampling Interval..... continuous

Summary Interval ..... daily

Instrumentation Description

Belfort Weighing Rain Gage Cat. No. 5-780 Belfort Non-Recording Rain Gage Cat. No. 5-400

Methods Description

Hubbard Brook precipitation is collected through a series of 25 standard rain gages and 7 recording rain gages scattered among the 9 gaged watersheds. Each standard gage is prorated by one of the recording gages. A theissen weighting method is applied to the prorated standard gages to calculate a daily watershed precipitation total. Daily watershed precip is the sum of each daily standard gage precip X theissen weight for that standard gage. theissen weights for WS3: standard gage 2 - .08 standard gage 3 - .39 standard gage 4 - .19 standard gage 5 - .34

Watershed 4 Precipitation

Precipitation

Begin Date..... 19600101

Data Logger Sampling Interval..... continuous

Summary Interval ..... daily

Instrumentation Description

Belfort Weighing Rain Gage Cat. No. 5-780 Belfort Non-Recording Rain Gage Cat. No. 5-400

Methods Description

Hubbard Brook precipitation is collected through a series of 25 standard rain gages and 7 recording rain gages scattered among the 9 gaged watersheds. Each standard gage is prorated by one of the recording gages. A theissen weighting method is applied to the prorated standard gages to calculate a daily watershed precipitation total. Daily watershed precip is the sum of each daily standard gage precip X theissen weight for that standard gage. theissen weights for WS4: standard gage 1 - .03 standard gage 2 - .08 standard gage 3 - .01 standard gage 6 - .30 standard gage 7 - .30 standard gage 8 - .28

Watershed 5 Precipitation

Precipitation

Begin Date..... 19640101

Data Logger Sampling Interval..... continuous

Summary Interval ..... daily

Instrumentation Description

Belfort Weighing Rain Gage Cat. No. 5-780 Belfort Non-Recording Rain Gage Cat. No. 5-400

Methods Description

Hubbard Brook precipitation is collected through a series of 25 standard rain gages and 7 recording rain gages scattered among the 9 gaged watersheds. Each standard gage is prorated by one of the recording gages. A theissen weighting method is applied to the prorated standard gages to calculate a daily watershed precipitation total. Daily watershed precip is the sum of each daily standard gage precip X theissen weight for that standard gage. theissen weights for WS5: standard gage 6 - .32 standard gage 7 - .30 standard gage 9 - .06 standard gage 10 - .11 standard gage 11 - .21

Watershed 6 Precipitation

Precipitation

Begin Date..... 19640101

Data Logger Sampling Interval..... continuous

Summary Interval ..... daily

Instrumentation Description

Belfort Weighing Rain Gage Cat. No. 5-780 Belfort Non-Recording Rain Gage Cat. No. 5-400

Methods Description

Hubbard Brook precipitation is collected through a series of 25 standard rain gages and 7 recording rain gages scattered among the 9 gaged watersheds. Each standard gage is prorated by one of the recording gages. A theissen weighting method is applied to the prorated standard gages to calculate a daily watershed precipitation total. Daily watershed precip is the sum of each daily standard gage precip X theissen weight for that standard gage. theissen weights for WS6: standard gage 9 - .31 standard gage 10 - .49 standard gage 11 - .20

Watershed 7 Precipitation

Precipitation

Begin Date..... 19650101

Data Logger Sampling Interval..... continuous

Summary Interval ..... daily

Instrumentation Description

Belfort Weighing Rain Gage Cat. No. 5-780 Belfort Non-Recording Rain Gage Cat. No. 5-400

Methods Description

Hubbard Brook precipitation is collected through a series of 25 standard rain gages and 7 recording rain gages scattered among the 9 gaged watersheds. Each standard gage is prorated by one of the recording gages. A theissen weighting method is applied to the prorated standard gages to calculate a daily watershed precipitation total. Daily watershed precip is the sum of each daily standard gage precip X theissen weight for that standard gage. theissen weights for WS7: standard gage 12 - .13 standard gage 13 - .16 standard gage 14 - .29 standard gage 15 - .14 standard gage 16 - .15 standard gage 17 - .13

Watershed 8 Precipitation

Precipitation

Begin Date..... 19690101

Data Logger Sampling Interval..... continuous

Summary Interval ..... daily

Instrumentation Description

Belfort Weighing Rain Gage Cat. No. 5-780 Belfort Non-Recording Rain Gage Cat. No. 5-400

Methods Description

Hubbard Brook precipitation is collected through a series of 25 standard rain gages and 7 recording rain gages scattered among the 9 gaged watersheds. Each standard gage is prorated by one of the recording gages. A theissen weighting method is applied to the prorated standard gages to calculate a daily watershed precipitation total. Daily watershed precip is the sum of each daily standard gage precip X theissen weight for that standard gage. theissen weights for WS8: standard gage 15 - .14 standard gage 17 - .14 standard gage 19 - .16 standard gage 20 - .39 standard gage 21 - .17

Watershed 9 Precipitation

Precipitation

Begin Date..... 19950101

Data Logger Sampling Interval..... continuous

Summary Interval ..... daily

Instrumentation Description

Belfort Weighing Rain Gage Cat. No. 5-780 Belfort Non-Recording Rain Gage Cat. No. 5-400

Methods Description

Hubbard Brook precipitation is collected through a series of 25 standard rain gages and 7 recording rain gages scattered among the 9 gaged watersheds. Each standard gage is prorated by one of the recording gages. A theissen weighting method is applied to the prorated standard gages to calculate a daily watershed precipitation total. Daily watershed precip is the sum of each daily standard gage precip X theissen weight for that standard gage. theissen weights for WS9: standard gage 17 - .12 standard gage 21 - .21 standard gage 23 - .08 standard gage 24 - .38 standard gage 25 - .21

Watershed

Watershed 1

Watershed Spatial Characteristics

North bounding coordinate (decimal degrees) 43.95927
West bounding coordinate (decimal degrees) .....-71.73133
South bounding coordinate (decimal degrees) 43.95206
East bounding coordinate (decimal degrees) .....-71.72630
Area (hectares) 11.8
Aspect (degrees azmuth) S22E
Minimum watershed elevation (meters; a.m.s.l) 488
Maximum watershed elevation (meters; a.m.s.l) 747

Watershed Ecological Characteristics

Mean annual precipitation (millimeters) 1322
Mean annual radiation (Megajoules per square meter per day) 1253
Slope (Percent) 18.6

Slope description

slope of a plane fitted to the watershed circumference

Mean snowpack description

200 mm

Watershed Descriptions

Soil description

Soils at Hubbard Brook are predominantly well-drained Spodosols, more specifically, Typic Haplorthods, derived from glacial till, with sandy loam textures. There are no residual soils, (i.e., derived from weathered bedrock). Principal soil series are the sandy loams of the Berkshire series, along with the Skerry, Becket, and Lyman series. These soils are acidic (pH about 4.5 or less) and relatively infertile (Table 1). A 20- to 200-mm thick forest floor layer is present, except where the soil surface has been disturbed by fallen trees. Long-term measurements suggest that the forest floor is at steady-state (Figure 4). This layer permits rapid infiltration of water and protects the soil from freezing before snow accumulates in winter (except in rare winters when snowfall is light). There is virtually no overland flow at the HBEF. Soil depths, including unweathered till, average about 2.0 m surface to bedrock, although this is highly variable. Soil on the ridgetops may consist of a thin accumulation of organic matter, resting directly on bedrock. The separation between the

pedogenic zone and the virtually unweathered till and bedrock below is distinct. Depth to the C horizon averages about 0.6 m. At various places in the Forest, the C horizon exists as an impermeable pan. These layers restrict root development and water movement. Rocks of all sizes are scattered throughout the soil profile. In many locations boulder fields are prominent features. A prominent feature of the surface topography throughout the HBEF is the rough pit-and-mound appearance caused by the uprooting of trees. Such uprooting mixes mineral soil from below with nutrient-rich organic surface layers and/or deposits the lower mineral layers directly on top of the forest floor humus layers without mixing, creating buried horizons. This natural disturbance changes seedbed conditions for regenerating species, and affects weathering and biogeochemical cycles.

Geology description

The eastern portion of the Experimental Forest (watersheds 1-6, and 9 included) is underlain by a complex assemblage of metasedimentary and igneous rocks. The major map unit is the Silurian Rangeley Formation, consisting of quartz mica schist and quartzite interbedded with sulfidic schist and calc-silicate granulite. Originally deposited as mudstones, sandstones and conglomerates, these rocks have been metamorphosed to sillimanite grade and have undergone four stages of deformation. Deformation style evident in outcrops is primarily tight isoclinal folds. However joints, slickensides and mylonites indicate brittle deformation as well. The metamorphic rocks were later intruded by a variety of igneous rocks including the Devonian Concord Granite, pegmatites, and Mesozoic diabase and lamprophyre dikes. The western portion of the forest (portions of watersheds 7 and 8 included) is underlain by the Devonian Kinsman Granodiorite, a foliated granitic rock with megacrysts of potassium feldspar. Continental glaciers, which blanketed the region during the Pleistocene and retreated some 13,000 years ago, removed most preexisting soils. Glacial movement was primarily in a southeasterly direction as indicated by striations on bedrock surfaces, and fragments of rocks in the till which are typical of bedrock to the northwest of the Hubbard Brook Valley. Materials deposited by the glacier are highly variable in degree of sorting and grain size, ranging from clays to 10m diameter boulders. The depth of glacial deposits ranges from zero on ridgetops and in stream valleys (resulting in bedrock outcrops) to 50m in the vicinity of Mirror Lake. Poorly sorted glacial till, commonly 2m thick, covers the bedrock in most of the valley. Ice contact terraces in the lower valley, consisting of well sorted sands and gravels, are typically 10s of meters thick. Detailed studies of the sediment in Mirror Lake (some 12-13 m thick) have revealed much about the glacial history of the area.

Treatment History

In November 1999, wollastonite (CaSiO3), pelletized with a 4% lignosulfonate binder, was applied by helicopter in a effort to replace the calcium that has been depleted from soil over the last 50 years due to inputs of acid rain. Forty-five tons of wollastonite (1.2 tonnes/ha) were added to W1 to increase the base saturation of soil from approximately 10% to 19%. The added wollastonite has a distinctive calcium to strontium ratio and strontium stable isotope ratio which will enable us to track the fate of the added material.

Watershed 2

Watershed Spatial Characteristics

North bounding coordinate (decimal degrees) 43.96024
West bounding coordinate (decimal degrees) .....-71.72871
South bounding coordinate (decimal degrees) 43.95335
East bounding coordinate (decimal degrees) .....-71.72343
Area (hectares) 15.6
Aspect (degrees azmuth) S31E
Minimum watershed elevation (meters; a.m.s.l) 503
Maximum watershed elevation (meters; a.m.s.l) 716

Watershed Ecological Characteristics

Mean annual precipitation (millimeters) 1315
Mean annual radiation (Megajoules per square meter per day) 1253
Slope (Percent) 18.5

Slope description

slope of a plane fitted to the watershed circumference

Mean snowpack description

200 mm

Watershed Descriptions

Soil description

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Treatment History

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2,4,5-T was sprayed from the ground on the persistent regrowing vegetation with backpack mist blowers. Beginning in 1969, vegetation was allowed to regrow (Likens et al. 1970; Nodvin et al. 1988; Reiners 1992).

Watershed 3

Watershed Spatial Characteristics

North bounding coordinate (decimal degrees) 43.96214
West bounding coordinate (decimal degrees) .....-71.72552
South bounding coordinate (decimal degrees) 43.95458
East bounding coordinate (decimal degrees) .....-71.71700
Area (hectares) 42.4
Aspect (degrees azmuth) S23W
Minimum watershed elevation (meters; a.m.s.l) 527
Maximum watershed elevation (meters; a.m.s.l) 732

Watershed Ecological Characteristics

Mean annual precipitation (millimeters) 1324
Mean annual radiation (Megajoules per square meter per day) 1253
Slope (Percent) 12.1

Slope description

slope of a plane fitted to the watershed circumference

Mean snowpack description

200 mm

Watershed Descriptions

Soil description

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depths, including unweathered till, average about 2.0 m surface to bedrock, although this is highly variable. Soil on the ridgetops may consist of a thin accumulation of organic matter, resting directly on bedrock. The separation between the pedogenic zone and the virtually unweathered till and bedrock below is distinct. Depth to the C horizon averages about 0.6 m. At various places in the Forest, the C horizon exists as an impermeable pan. These layers restrict root development and water movement. Rocks of all sizes are scattered throughout the soil profile. In many locations boulder fields are prominent features. A prominent feature of the surface topography throughout the HBEF is the rough pit-and-mound appearance caused by the uprooting of trees. Such uprooting mixes mineral soil from below with nutrient-rich organic surface layers and/or deposits the lower mineral layers directly on top of the forest floor humus layers without mixing, creating buried horizons. This natural disturbance changes seedbed conditions for regenerating species, and affects weathering and biogeochemical cycles.

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Treatment History

None; hydrologic reference watershed

Watershed 4

Watershed Spatial Characteristics

North bounding coordinate (decimal degrees) 43.95837
West bounding coordinate (decimal degrees) .....-71.73720
South bounding coordinate (decimal degrees) 43.94979
East bounding coordinate (decimal degrees) .....-71.72559
Area (hectares) 36.1
Aspect (degrees azmuth) S40E
Minimum watershed elevation (meters; a.m.s.l) 442
Maximum watershed elevation (meters; a.m.s.l) 747

Watershed Ecological Characteristics

Mean annual precipitation (millimeters) 1358
Mean annual radiation (Megajoules per square meter per day) 1253
Slope (Percent) 15.6

Slope description

slope of a plane fitted to the watershed circumference

Mean snowpack description

200 mm

Watershed Descriptions

Soil description

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surface topography throughout the HBEF is the rough pit-and-mound appearance caused by the uprooting of trees. Such uprooting mixes mineral soil from below with nutrient-rich organic surface layers and/or deposits the lower mineral layers directly on top of the forest floor humus layers without mixing, creating buried horizons. This natural disturbance changes seedbed conditions for regenerating species, and affects weathering and biogeochemical cycles.

Geology description

The eastern portion of the Experimental Forest (watersheds 1-6, and 9 included) is underlain by a complex assemblage of metasedimentary and igneous rocks. The major map unit is the Silurian Rangeley Formation, consisting of quartz mica schist and quartzite interbedded with sulfidic schist and calc-silicate granulite. Originally deposited as mudstones, sandstones and conglomerates, these rocks have been metamorphosed to sillimanite grade and have undergone four stages of deformation. Deformation style evident in outcrops is primarily tight isoclinal folds. However joints, slickensides and mylonites indicate brittle deformation as well. The metamorphic rocks were later intruded by a variety of igneous rocks including the Devonian Concord Granite, pegmatites, and Mesozoic diabase and lamprophyre dikes. The western portion of the forest (portions of watersheds 7 and 8 included) is underlain by the Devonian Kinsman Granodiorite, a foliated granitic rock with megacrysts of potassium feldspar. Continental glaciers, which blanketed the region during the Pleistocene and retreated some 13,000 years ago, removed most preexisting soils. Glacial movement was primarily in a southeasterly direction as indicated by striations on bedrock surfaces, and fragments of rocks in the till which are typical of bedrock to the northwest of the Hubbard Brook Valley. Materials deposited by the glacier are highly variable in degree of sorting and grain size, ranging from clays to 10m diameter boulders. The depth of glacial deposits ranges from zero on ridgetops and in stream valleys (resulting in bedrock outcrops) to 50m in the vicinity of Mirror Lake. Poorly sorted glacial till, commonly 2m thick, covers the bedrock in most of the valley. Ice contact terraces in the lower valley, consisting of well sorted sands and gravels, are typically 10s of meters thick. Detailed studies of the sediment in Mirror Lake (some 12-13 m thick) have revealed much about the glacial history of the area.

Treatment History

The next watershed manipulation was conducted to assess the effects of strip cutting on water yield and nutrient input-output budgets. Watershed 4 was divided into 49 east-west strips (almost following topographic contours) 25 m wide. In the autumn of 1970, every third strip was cut. The second series of strips was cut in 1972, leaving one series of strips uncut. Finally in 1974, the last set of strips was cut. Except for a variable width buffer of trees that was left along the main stream channel, the entire watershed was clear-cut in these three phases. All trees to a minimum of 5 cm were felled, and all products of value to the logging contractor were removed by rubber-tired skidder. Dense natural regrowth is occurring. Generally, regrowth of vegetation in northern hardwood stands in the area is profuse (Hornbeck et al. 1987).

Watershed 5

Watershed Spatial Characteristics

North bounding coordinate (decimal degrees) 43.95709
West bounding coordinate (decimal degrees) .....-71.73983
South bounding coordinate (decimal degrees) 43.94885
East bounding coordinate (decimal degrees) .....-71.73170
Area (hectares) 21.9
Aspect (degrees azmuth) S24E
Minimum watershed elevation (meters; a.m.s.l) 488
Maximum watershed elevation (meters; a.m.s.l) 762

Watershed Ecological Characteristics

Mean annual precipitation (millimeters) 1389
Mean annual radiation (Megajoules per square meter per day) 1253
Slope (Percent) 15.4

Slope description

slope of a plane fitted to the watershed circumference

Mean snowpack description

200 mm

Watershed Descriptions

Soil description

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Treatment History

This watershed manipulation was designed to assess the effects of a commercial whole-tree harvest on nutrient cycles. Watershed 5 (21.9 ha) was whole-tree clearcut during the autumn of 1983 through the spring of 1984. All trees larger than 10 cm in diameter at breast height were harvested by removal of whole trees (bole and tops) using a feller-buncher machine on accessible slopes and chain saws on steep inaccessible slopes. Trees were removed, unlimbed, using skidders (Fahey et al. 1988; Johnson et al. 1991a,b; Dahlgren and Driscoll 1994).

Watershed 6

Watershed Spatial Characteristics

North bounding coordinate (decimal degrees) 43.95702
West bounding coordinate (decimal degrees) .....-71.74347
South bounding coordinate (decimal degrees) 43.94993
East bounding coordinate (decimal degrees) .....-71.73564
Area (hectares) 13.2
Aspect (degrees azmuth) S32E
Minimum watershed elevation (meters; a.m.s.l) 549
Maximum watershed elevation (meters; a.m.s.l) 792

Watershed Ecological Characteristics

Mean annual precipitation (millimeters) 1423
Mean annual radiation (Megajoules per square meter per day) 1253
Slope (Percent) 15.8

Slope description

slope of a plane fitted to the watershed circumference

Mean snowpack description

200 mm

Watershed Descriptions

Soil description

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Treatment History

None; biogeochemical reference watershed

Watershed 7

Watershed Spatial Characteristics

North bounding coordinate (decimal degrees) 43.92747
West bounding coordinate (decimal degrees) .....-71.77348
South bounding coordinate (decimal degrees) 43.91604
East bounding coordinate (decimal degrees) .....-71.75883
Area (hectares) 76.4
Aspect (degrees azmuth) N16W
Minimum watershed elevation (meters; a.m.s.l) 619
Maximum watershed elevation (meters; a.m.s.l) 899

Watershed Ecological Characteristics

Mean annual precipitation (millimeters) 1450
Mean annual radiation (Megajoules per square meter per day) 1253
Slope (Percent) 12.4
Slope description

slope of a plane fitted to the watershed circumference

Mean snowpack description

300 mm

Watershed Descriptions

Soil description

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Treatment History

None

Watershed 8

Watershed Spatial Characteristics

North bounding coordinate (decimal degrees) 43.92944
West bounding coordinate (decimal degrees) .....-71.76253
South bounding coordinate (decimal degrees) 43.91798
East bounding coordinate (decimal degrees) .....-71.75286
Area (hectares) 59.4
Aspect (degrees azmuth) N12W

Minimum watershed elevation (meters; a.m.s.l) 610
Maximum watershed elevation (meters; a.m.s.l) 905

Watershed Ecological Characteristics

Mean annual precipitation (millimeters) 1471
Mean annual radiation (Megajoules per square meter per day) 1253
Slope (Percent) 14.0

Slope description

slope of a plane fitted to the watershed circumference

Mean snowpack description

300 mm

Watershed Descriptions

Soil description

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Treatment History

None

Watershed 9

Watershed Spatial Characteristics

North bounding coordinate (decimal degrees) 43.92589
West bounding coordinate (decimal degrees) .....-71.75851
South bounding coordinate (decimal degrees) 43.91597
East bounding coordinate (decimal degrees) .....-71.74272
Area (hectares) 68.4
Aspect (degrees azmuth) .....NE
Minimum watershed elevation (meters; a.m.s.l) 685
Maximum watershed elevation (meters; a.m.s.l) 910

Watershed Ecological Characteristics

Mean annual precipitation (millimeters) 1564

Mean annual radiation (Megajoules per square meter per day) 1253

Mean snowpack description

300 mm

Watershed Descriptions

Soil description

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Treatment History

None

Gauging Stations

Watershed 1

Hydrologic Gauging Station

Latitude (decimal degrees) 43.952
Longitude (decimal degrees) .....-71.727
Elevation (meters; a.m.s.l.) 488
Begin Date..... 1956/01/01
Watershed Area (hectares) 11.8
Associated meteorological station

Precipitation=WS1P; Air Temperature=WEASTA_1

Weir Description

Stevens A-35 streamflow recorder 90o sharp-crested V-notch weir

Stream Discharge

Data Logger Sampling Interval..... continuous
Summary Interval ..... daily

Watershed 2

Hydrologic Gauging Station

Latitude (decimal degrees) 43.953
Longitude (decimal degrees) .....-71.724
Elevation (meters; a.m.s.l.) 503
Begin Date..... 1957/10/01
Watershed Area (hectares) 15.6
Associated meteorological station

Precipitation=WS2P; Air Temperature=WEASTA_1

Weir Description

Stevens A-35 streamflow recorder 120o sharp-crested V-notch weir

Stream Discharge

Data Logger Sampling Interval..... continuous
Summary Interval ..... daily

Watershed 3

Hydrologic Gauging Station

Latitude (decimal degrees) 43.955
Longitude (decimal degrees) .....-71.723
Elevation (meters; a.m.s.l.) 527
Begin Date..... 1957/10/01
Watershed Area (hectares) 42.4
Associated meteorological station
Precipitation=WS3P; Air Temperature=WEASTA_1
Weir Description
Stevens A-35 streamflow recorder 120o sharp-crested V-notch weir

Stream Discharge

Data Logger Sampling Interval..... continuous
Summary Interval ..... daily

Watershed 4

Hydrologic Gauging Station

Latitude (decimal degrees) 43.950
Longitude (decimal degrees) .....-71.726
Elevation (meters; a.m.s.l.) 442
Begin Date..... 1960/07/01
Watershed Area (hectares) 36.1
Associated meteorological station
Precipitation=WS4P; Air Temperature=WEASTA_6
Weir Description
Stevens A-35 streamflow recorder 120o sharp-crested V-notch weir

Stream Discharge

Data Logger Sampling Interval..... continuous
Summary Interval ..... daily

Watershed 5

Hydrologic Gauging Station

Latitude (decimal degrees) 43.949
Longitude (decimal degrees) .....-71.732
Elevation (meters; a.m.s.l.) 488
Begin Date..... 1962/01/01
Watershed Area (hectares) 21.9
Associated meteorological station

Precipitation=WS5P; Air Temperature=WEASTA_6

Weir Description

Stevens A-35 streamflow recorder Combination: 90o sharp-crested V-notch, and modified San Dimas, flume

Stream Discharge

Data Logger Sampling Interval..... continuous
Summary Interval ..... daily

Watershed 6

Hydrologic Gauging Station

Latitude (decimal degrees) 43.950
Longitude (decimal degrees) .....-71.736
Elevation (meters; a.m.s.l.) 549
Begin Date..... 1963/01/01
Watershed Area (hectares) 13.2
Associated meteorological station

Precipitation=WS6P; Air Temperature=WEASTA_6

Weir Description

Stevens A-35 streamflow recorder Combination: 90o sharp-crested V-notch, and modified San Dimas, flume

Stream Discharge

Data Logger Sampling Interval..... continuous
Summary Interval ..... daily

Watershed 7

Hydrologic Gauging Station

Latitude (decimal degrees) 43.928
Longitude (decimal degrees) .....-71.767
Elevation (meters; a.m.s.l.) 619
Begin Date..... 1965/01/01
Watershed Area (hectares) 76.4
Associated meteorological station

Precipitation=WS7P; Air Temperature=WEASTA_14

Weir Description

Stevens A-35 streamflow recorder Combination: 120o sharp-crested V-notch, and modified San Dimas, flume

Stream Discharge

Data Logger Sampling Interval..... continuous
Summary Interval ..... daily

Watershed 8

Hydrologic Gauging Station

Latitude (decimal degrees) 43.929
Longitude (decimal degrees) .....-71.760
Elevation (meters; a.m.s.l.) 610
Begin Date..... 1968/05/01

Watershed Area (hectares) 59.4

Associated meteorological station

Precipitation=WS8P; Air Temperature=WEASTA_17

Weir Description

Steverns A-35 streamflow recorder Combination: 120o sharp-crested V-notch, and modified San Dimas, flume

Stream Discharge

Data Logger Sampling Interval..... continuous

Summary Interval ..... daily

Watershed 9

Hydrologic Gauging Station

Latitude (decimal degrees) 43.926

Longitude (decimal degrees) .....-71.747

Elevation (meters; a.m.s.l.) 685

Begin Date..... 1995/01/01

Watershed Area (hectares) 68.4

Associated meteorological station

Precipitation=WS9P; Air Temperature=WEASTA_24

Weir Description

Stevens A-35 streamflow recorder 120o sharp-crested V-notch weir

Stream Discharge

Data Logger Sampling Interval..... continuous

Summary Interval ..... daily