

APPENDIX B

Water Use Plans

Lamprey River Water Management Plan

August 2013

WATER USE PLAN

Epping Water Works (#20045)

Introduction

The following Water Use Plan (WUP) has been prepared for Epping Water Works, which supplies water for the Town of Epping, New Hampshire. This WUP was prepared using information provided by Epping Water Works and from their water use records reported to the Department of Environmental Services (DES). Epping Water Works has five registered water sources that are located within the Town. Two sources are located in the vicinity of Hoar Pond, which drains into the Lamprey River, and three sources are located on a tributary to the Piscassic River, which discharges into the Lamprey Designated River at the Newmarket/Durham town line.

Under the Instream Flow Rules (Chapter Env-Wq 1900), Epping Water Works is considered an Affected Water User because its registered water sources are within 500 ft of the Lamprey Designated River or its tributaries. In addition, its registered water sources are within the Lamprey River Water Management Planning Area (“Planning Area”), which is the watershed area of the Lamprey Designated River. Under Chapter Env-Wq 1900, individual WUPs are to be prepared for each Affected Water User located within the Lamprey River Planning Area. Each individual WUP is to include:

- Water use data and information to define water use patterns and needs for each Affected Water User;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan for each Affected Water User; and,
- An implementation schedule for the individual WUP.

Water Source and Uses

The Epping Water Works supply source consists of five registered wells located in Epping, of which four are actively used (20045-S02; 20045-S03; 20045-S04 and 20045-S05) and one is inactive and will not be reactivated for future use (20045-S01). The Hoar Pond Well 1 (20045-S02) and the Hoar Pond Well 2 (20045-S04) are active bedrock wells located north of Hoar Pond and east of Beniah Lane. The Fremont Road Well (20045-S03), an active bedrock well and Well #1 (20045-S01) an inactive gravel packed well are located along Fremont Road (aka Jenness Road) near an unnamed tributary to the Piscassic River. The fifth well, Hoar Pond Well No. 3 (20045-S05), was developed in bedrock in the vicinity of Hoar Pond. Well use was reported beginning March 2012. 20045-S05 is not included in the GIS coverages yet, but would be located on the map near 20045-S04 and 20045-S02.

Water Use Patterns

The groundwater withdrawn from the four active wells is the water supply for the residents

and businesses in the Town. The well pumping rates of the wells are variable. The Hoar Pond wells are permitted for 185 gallons per minute (gpm). The pumping capacity of the Fremont Well is about 40 gpm. The pumping schedule and rates are set by the operators and the wells come on when they are needed to maintain the water levels in the two storage tanks that have a combined capacity of 500,000 gallons. The wells are metered and monthly water use is reportedly quarterly to DES.

Water use data for 1992 through 2012 are summarized in the tables and figures below. Water use data for Epping Water Works were obtained from DES. The water use records for 1989 through 1991, and for 2013, were incomplete so they were not included in the annual use summaries. The monthly summaries include the complete records for the years of 1992 through 2012.

Between 1992 and 2012, annual water use by Epping Water Works ranged from a high of 51.9 million gallons (1999), to a low of 32.4 million gallons (1992) with an average annual use of 41.06 million gallons (Figure 1 and Table 1). During this period the annual water use increased by 18.73 million gallons or 57.7 percent. This represents an average increase of 0.89 million gallons per year or 2.75 percent per year for the 21 year period of record.

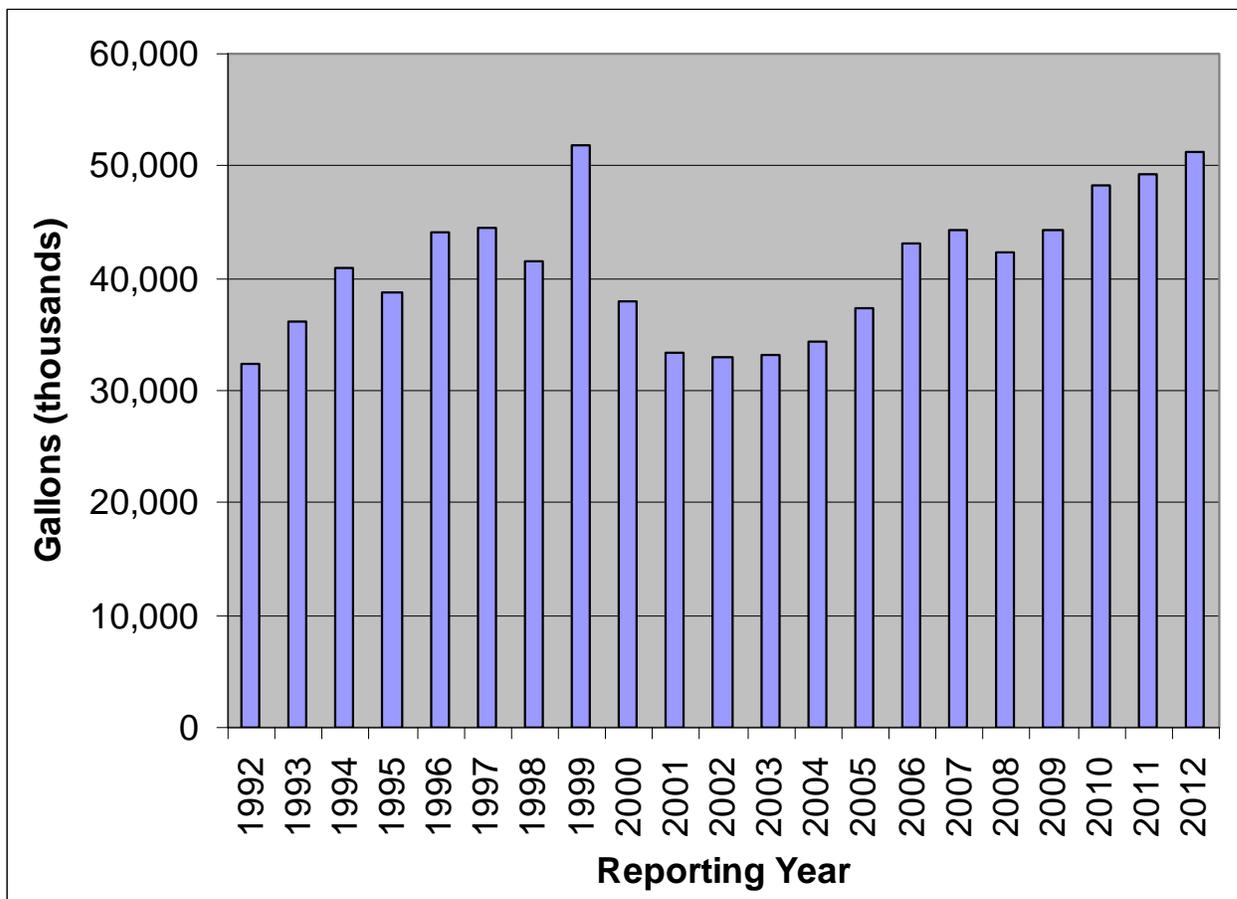


Figure 1 - EPPING WATER WORKS (20045) - Annual Water Use

Table 1 - Epping Water Works Annual Water Use (1992-2012)

	Low	High	Average
Thousands of Gallons	32,452	51,937	41,060
cfs	0.1376	0.2202	0.1741
cfsm at Packers Falls Gage	0.00075	0.00120	0.00095

Monthly water use varies in response to weather conditions and changes in seasonal demand. For the system, the total and average monthly water usage was highest during summer and lowest during winter. This seasonal pattern reflects increased outdoor water usage (lawn irrigation, garden watering, vehicle washing, etc.) during the summer months, which then declines during the fall, remains low during the winter, and begins to increase again in the spring. The highest monthly use was 5.007 million gallons (July 2011), the lowest monthly use was 2.338 million gallons (February 1992), while the average monthly use (1992-2012) was 3.422 million gallons (Figure 2 and Table 2).

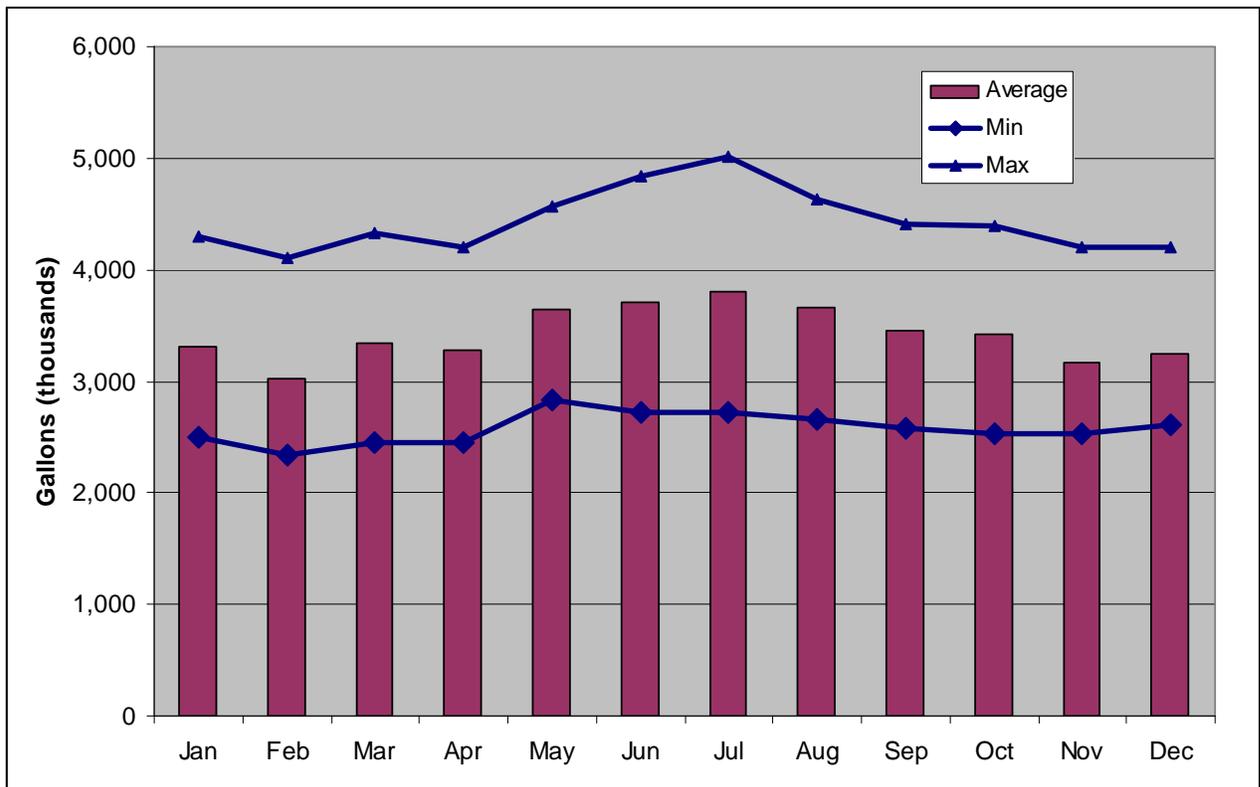


Figure 2 - EPPING WATER WORKS - Monthly Water Use (1992-2012)

Table 2 - Epping Water Works Monthly Water Use Statistics (1992-2012)

	Low	High	Average
Thousands of Gallons	2,338	5,007	3,422
cfs	0.1189	0.2547	0.1741
cfsm at Packers Falls Gage	0.00065	0.00139	0.00095

The monthly water use data for Epping Water Works was converted from thousand gallons per month to cubic feet per second by dividing the monthly values by days and multiplying them by a flow unit conversion factor (Table 2). Daily water use by Epping Water Works has ranged from a minimum of 0.119 cfs (80,621 gallons per day, February 1992) to a maximum of 0.255 cfs (161,526 gallons per day, July 2011), with an average use of 0.174 cfs (112,493 gallons per day) for the period of 1992 to 2012.

Potential for Water Use Management to Support Protected Instream Flows

Epping Water Works has limited potential to manage its water use to support the Protected Instream Flows on the Lamprey Designated River. Epping's existing water supply consists of three bedrock wells, two of which are located near Hoar Pond, and the other of which is located off of Fremont Road in the Piscassic River drainage basin. The effects of the well withdrawal impacts on Lamprey River stream flow were evaluated (DES 2009a). Only the Fremont Road well was identified as having a potential effect on the flow of a tributary to the Piscassic River, which is a tributary of the Lamprey Designated River. These results are being discounted for two reasons. The assessment was conducted using worst-case conditions that the bedrock wells affect stream flow as if they were sand and gravel wells. Also, because of reduced productivity in this well, the reported well use has declined significantly in the past two years. These factors lead to the conclusion that water withdrawals from this well do not have an immediate effect on the stream flow of the Lamprey tributary by inducing recharge.

Although the Epping water supply wells are not expected to have an immediate effect on stream flow, the extraction of groundwater that would otherwise recharge the river or its tributaries does require management, particularly when flow in the river is dependent on groundwater recharge. This condition typically occurs during the summer and early fall, when flows in the river are at a minimum.

Water Use Plan Activity

Epping Water Works has an established Emergency Action Plan (Town of Epping Water Department 2009) that includes a multi-stage, outside water use reduction plan that applies during periods of drought. Outside water use reduction will be accomplished by implementing the plans for outdoor water use reduction included in the Emergency Action Plan (Town of Epping Water Department 2009). Outside water use is heaviest during the summer and early fall. The outside water use reduction plans apply to the two bioperiods that have the highest levels of outside water use, occurring from June 20 to October 6, and when flows in the Lamprey Designated River fall below the rare protected instream flow levels (DES 2009b). Under this Water Use Plan, outdoor water use will be reduced in two stages: an alert with voluntary water conservation, followed by an enforced water use ban.

The prompts for these conservation actions are determined from flow measurements at the United States Geological Survey gaging station on the Lamprey Designated River near Newmarket (0173500). The actions in this Water Use Plan are based on mean daily flow conditions recorded at this gage and based on conditions defined on the DES Instream Flow Program website.

The first action is an alert from DES. During the period from June 20 to October 6, on the first day after the daily mean discharge at the gage falls below 16 cfs, DES will issue an advisory to the Affected Water Users in the Water Management Planning Area. This flow condition represents the rare protected instream flow magnitude. The alert will include a request that voluntary water conservation measures should be taken and a statement that further actions may begin soon if conditions continue to worsen. The Town will distribute the DES advisory to its water users through the Town's website or other suitable notification methods, or both. The Town may rescind an alert when natural rainfall events result in the daily mean discharge exceeding 18 cfs for two consecutive days. A flow release as part of the Lamprey Water Management Plan does not represent a natural exceedance of the protected flow.

If daily mean discharge in the Lamprey Designated River falls below 16 cfs during this period for longer than the 15 days, the Town will enforce a ban on outside water use as described in the Town's Emergency Action Plan (Town of Epping Water Department 2009). This flow condition represents the Rare, Catastrophic protected flow magnitude and duration (DES 2009b). At this flow level, DES intends to generate an artificial flow of water from upstream dams as a relief pulse to help support aquatic and riparian life of the river. The ban on outside water use may be rescinded by the Town when natural rainfall events result in daily mean discharge exceeding 16 cfs for two consecutive days.

A notice of the enforced outdoor water use ban to be implemented will be drafted by the Water and Sewer Commission. Notification of the water users will be the responsibility of the Town Water Administrator and Systems Operators and may include notices in the local newspaper, radio announcements and/or door-to-door distribution of printed notices. Enforcement of the outdoor water use ban will be performed by the Code Enforcement Officer.

Nothing in this Plan precludes the Town from implementing more restrictive water use actions on its own initiative.

Recordkeeping

Recordkeeping by Affected Water Users and Affected Dam Owners shall include documentation of the actions and the dates and times that management actions were taken to meet their Water Management Plans. This documentation shall include records of conditions affected by the management activities, including but not limited to changes in dam gate conditions, number of stoplogs in place, static water levels in impoundments, and pumping rates. From time to time and subject to available appropriations, DES will conduct audits of

the management activities taken by the Affected Water Users and Affected Dam Owners in response to protected stream flow conditions. These records will be retained and made available to DES on request. DES recommends, but does not require, that Affected Water Users and Affected Dam Owners create and retain documentation of the costs associated exclusively with water management activities defined by their Water Management Plans.

Estimated Water Use Plan Implementation Costs

The water use management actions are the implementation of Epping’s outdoor water use reductions or bans applied when flows on the Lamprey Designated River fall below the rare protected instream flow levels during summer and early fall during periods exceeding their catastrophic duration. There are no additional direct costs associated with the implementation of these water use management actions.

Water Use Management Plan Implementation Schedule

By June 1, 2014, the Town will implement its Water Use Plan and will institute the measures for the management of outdoor water use during the summer and early fall when flows on the Lamprey Designated River fall below the Rare protected instream flow levels for periods greater than their Catastrophic duration.

Water User Contact Information

Water User: Epping Water Works
Address: 157 Main Street, Epping, NH 03042
Contact: Dennis Koch, Water and Sewer Administrator
Phone: 679-5441 ext. 108
Email: waterandsewer@townofepping.com

Conversion Factors for Volume and Flow Units

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

Sources of Information

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/29/03.

Department of Environmental Services (DES) 2009a. Effects of Well Withdrawal Impacts on Lamprey River Stream Flow. NHDES-R-WD-09-5. Prepared by Normandeau Associates, Inc., Rushing Rivers Institute and the University of New Hampshire.

Department of Environmental Services (DES) 2009b. Final Lamprey Protected Instream Flow Report. Prepared by Normandeau Associates, Inc., Rushing Rivers Institute and the University of New Hampshire. NHDES-R-WD-08-26.

Survey of Lamprey River Affected Water Users performed by Normandeau Associates, Inc. completed by Dennis Koch, Epping Water Works.

Town of Epping Water Department (2009). Emergency Action Plan for the Municipal Water System. Prepared by: the Epping Water Department, Town of Epping Water Administrator and the Epping Water and Sewer Commission. Effective date March 2003, revised version March 2009.

Personal communication with Dennis Koch, Epping Water Works.

Personal communication with Norm Dionne, Epping Water Works.

Water use reports on file with the Department of Environmental Services (DES).

WATER USE PLAN

Raymond Water Department (#20061)

Introduction

The following Water Use Plan (WUP) has been prepared for the Raymond Water Department, which supplies water for the Town of Raymond, New Hampshire. This WUP was prepared using information provided by the Raymond Water Department and from their water use records reported to the Department of Environmental Services (DES). Raymond Water Department has three registered water sources, which are three overburden groundwater wells located in the Town and along the Lamprey River.

Under the Instream Flow Rules (Chapter Env-Wq 1900), the Raymond Water Department is considered an Affected Water User because its registered water source is within 500 ft of the Lamprey Designated River or its tributaries. In addition, its registered water source is within the Lamprey River Water Management Planning Area (“Planning Area”), which is the watershed area of the Lamprey Designated River. Under Chapter Env-Ws 1900, individual WUPs are to be prepared for each Affected Water User located within the Lamprey River Planning Area. Each individual WUP is to include:

- Water use data and information to define water use patterns and needs for each Affected Water User;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan for each Affected Water User; and,
- An implementation schedule for the individual WUP.

Water Source and Uses

The Raymond Water Department’s supply source consists of three stratified drift groundwater wells (1 to 3), which were registered and reported to DES as a single wellfield source (20061-S01) until September 2010. A fourth well that is no longer used is located in the center of town. All three active wells are located within 500 feet of the Lamprey River, upstream of the section of the Lamprey Designated River managed under this Water Management Plan.

Water Use Patterns

The groundwater withdrawn from the three active wells is the water supply for the residents and businesses in the Town. Water is withdrawn and the system is operated in a pattern common to municipal water supply needs that is moderated by the availability of system storage. Water demand follows a typical diurnal pattern. The wells are pumped at an equal withdrawal rate. When pumping exceeds demand, excess water fills the distribution system storage, and when pumping is less than demand, stored water makes up the difference. The pumping rates of the wells are variable and are set by the operators to operate approximately

20 hours per day. Depending on whether the Town is operating one, two or all three wells at a time the individual rates can range from 100 to 400 gallons per minute (gpm). Each well is metered and the total production is recorded daily. Monthly water use is reported quarterly to the DES.

Water use data for the Raymond Water Department wells for the years of 1988 through 2013 were obtained from the DES. The water use records for the system were incomplete for 1988 and 2013, so they are not included in the water use summaries. The monthly summaries include complete annual records for the years 1988 through 2012. Years of complete records are summarized in the figures and tables below.

Between 1989 and 2012 annual water use by Raymond Water Department ranged from a high of 121.88 million gallons (2009) to a low of 76.04 million gallons (1990), with an average annual use of 99.78 million gallons (Figure 1 and Table 1). Overall, annual water use has steadily increased over these 24 years (1989 to 2012), briefly reset by short periods of reduced water use after 1998, 2003 and 2010. During this period annual water use increased 26.10 million gallons or 33.25 percent. This represents an average increase of 1.087 million gallons per year or 1.4 percent per year for the 24 year period of record.

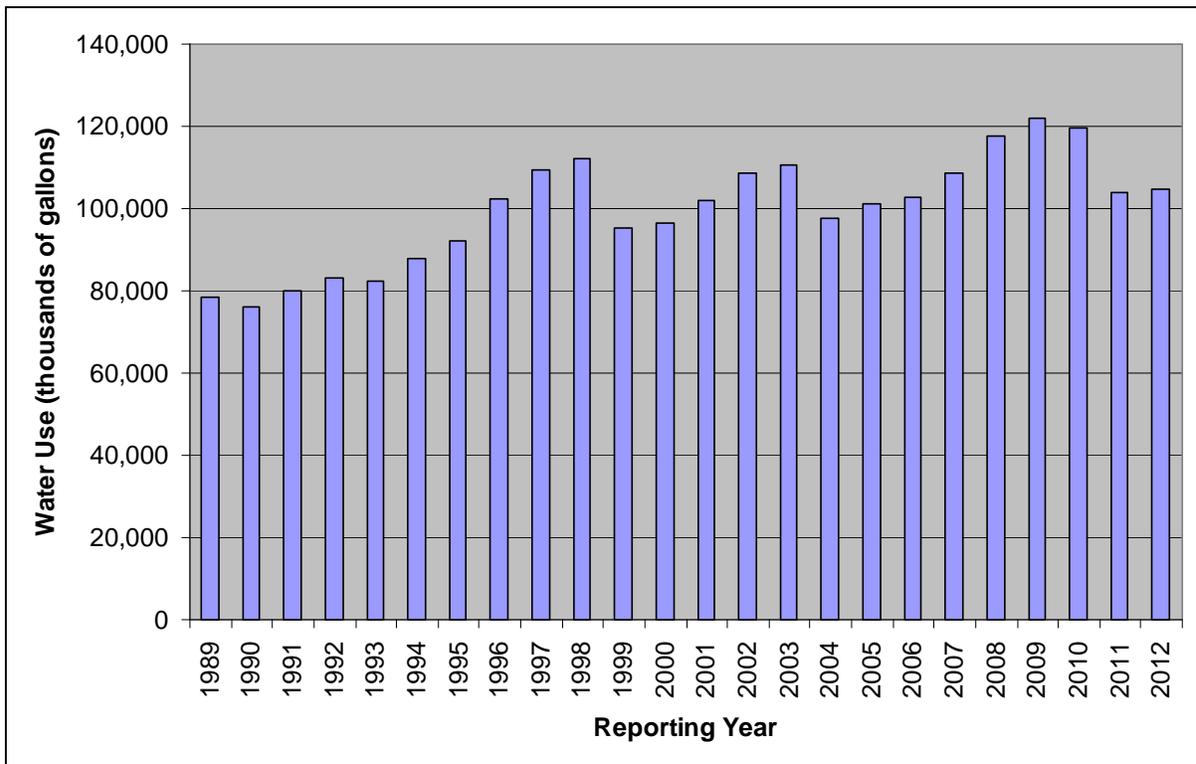


Figure 1 - RAYMOND WATER DEPARTMENT (#20061) - Annual Water Use (1989-2012)

Table 1 - Raymond Water Department - Annual Water Use Statistics (1989-2012)

	Low	High	Average
Thousands of Gallons	76,039	121,884	99,784
cfs	0.3224	0.5167	0.4230
cfsm at Packers Falls Gage	0.00176	0.00282	0.00231

The monthly water use records for the entire system begin in October 1988. Monthly water use varies in response to weather conditions and changes in seasonal demand. The total and average monthly water usage was highest during summer and lowest during winter (Figure 4). This seasonal pattern reflects increased outdoor water usage (lawn irrigation, garden watering, vehicle washing, etc.) during the summer months, which then declines during the fall, remains low during the winter, and begins to increase again in the spring. The highest monthly water use was 12.48 million gallons (July 1997), the lowest monthly water use was 4.230 million gallons (November 1989), while the average monthly water use was 8.315 million gallons (Figure 2 and Table 2).

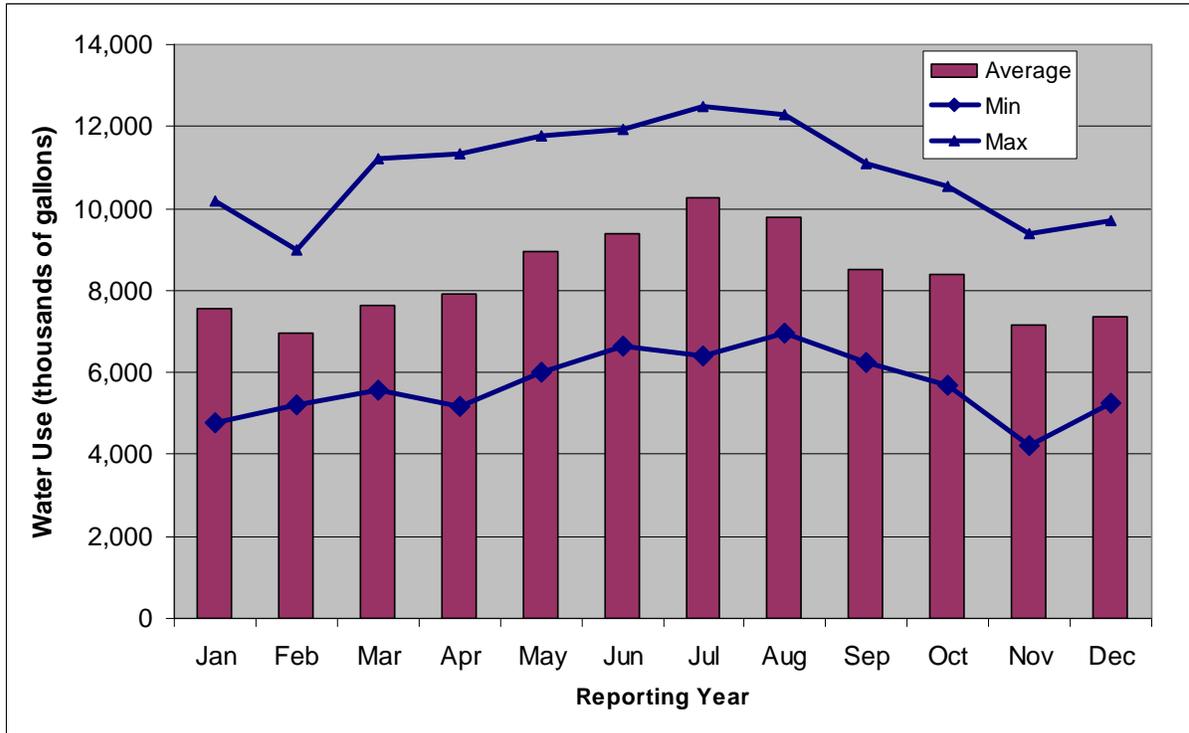


Figure 2 - RAYMOND WATER DEPARTMENT (20061) - Monthly Water Use (1989-2012)

Table 2 - Raymond Water Department - Monthly Water Use Statistics (1989-2012)

	Low	High	Average
Thousands of Gallons	4,232	12,483	8,315
cfs	0.2153	0.6350	0.4230
cfsm at Packers Falls Gage	0.00118	0.00347	0.00231

The monthly water use data for the Raymond Water Department were converted from thousands of gallons per month to cubic feet per second by dividing the monthly values by days and then multiplying this result by a flow unit conversion factor. Based on these values, the average daily water use by the Raymond Water Department has ranged from a minimum of 0.218 cfs (141,067 gallons per day, November 1989), to a maximum of 0.623 cfs (402,677 gallons per day, July 1997) with an average use of 0.423 cfs (273,381 gallons per day) for the period of 1989 through 2012 (Table 2).

Potential for Water Use Management to Support Protected Instream Flows

The Raymond Water Department has limited potential to manage its water use to support the Protected Instream Flows on the Lamprey Designated River. Raymond's existing water supply consists of three stratified drift groundwater wells located within 500 feet of the Lamprey River. The effects of the well withdrawal impacts on Lamprey River stream flow were evaluated (DES 2009a) and none of the wells were found to have an immediate effect on the flow of the Lamprey River. Assessment of these wells showed that none of them pumping individually at average or maximum withdrawal rates induces recharge from the nearest surface water tributary. Generally, this result directs water use planning toward long term strategies instead of changes in pumping schedule or other techniques that result in immediate or short term effects. Pumping all wells simultaneously was not evaluated and there is a small chance that all three wells pumping simultaneously could induce recharge. If, as expected, pumping these wells is not inducing recharge, then changing the pumping rate, duration or frequency will result in slower acting effects on stream flow that may not address in a timely manner the relatively short-term low flow management events that are expected.

Although the Raymond Water Department's supply wells may not have an immediate effect on the Lamprey River, the extraction of groundwater that would otherwise recharge the river requires management, particularly when flow in the river is mostly dependent on groundwater recharge. This condition typically occurs during the summer and early fall, when flows in the river are at a minimum.

Water Use Plan Activity

The Raymond Water Department has an established Emergency Plan (Town of Raymond 2009) that includes a multi-stage, outside water use reduction plan that applies during periods of drought. Outside water use reduction will be accomplished by implementing the plans for outdoor water use reduction included in the Emergency Plan (Town of Raymond 2009). Outside water use is heaviest during the summer and early fall. The outside water use reduction plans are applied to the two bioperiods that have the highest levels of outside water use, occurring from June 20 to October 6, and when flows in the Lamprey Designated River fall below the rare protected instream flow levels (DES 2009b). Under this Water Use Plan, outdoor water use will be reduced in two stages: an alert that includes voluntary water conservation, followed by an enforced water use ban.

The prompts for these conservation actions are determined from flow measurements at the United States Geological Survey gaging station on the Lamprey River near Newmarket (0173500). The actions in this Water Use Plan are based on mean daily flow conditions recorded at this gage or based on conditions defined on the DES web page at: http://www2.des.state.nh.us/onestoppub/watershed/lamprey_pisf_tracking.xls.

The first action is an alert from DES. During the period from June 20 to October 6, on the first day after daily mean discharge at the gage falls below 16 cfs, DES will issue an advisory to the Affected Water Users in the Water Management Planning Area. This flow condition represents the rare protected instream flow magnitude. The alert will include a request that voluntary water conservation measures should be taken and a statement that further actions may begin soon if conditions continue to worsen. The Town will pass the DES notification on to its water users through the Town's website or other suitable notification methods, or both. The Town may rescind an alert when natural rainfall events result in daily mean discharge exceeding 18 cfs for two consecutive days. A flow release as part of the Lamprey Water Management Plan does represent a natural exceedance of the protected flow.

If daily mean discharge in the Lamprey Designated River falls below 16 cfs during this period for longer than 15 days, the Town will enforce a ban on outside water use as described in the Level 2 Ban in the Town's Emergency Plan (Town of Raymond 2009). This flow condition represents the Rare, Catastrophic protected flow magnitude and duration (DES 2009b). At this flow level, DES intends to generate an artificial flow of water from upstream dams as a relief pulse to help support aquatic and riparian life of the river. The ban on outside water use may be rescinded by the Town when natural rainfall events result in daily mean discharge exceeding 16 cfs for two consecutive days.

The notification process for outside water use reductions is defined in the Town's Emergency Plan (Town of Raymond 2009). The Water Division Foreman, under instruction by the Town Manager, will implement notification of the water use restrictions. The Town of Raymond will notify residents of the water use restrictions using the "CodeRED" emergency notification system. This system issues emergency notices to residents and businesses at their registered phone numbers using a high-speed telephone calling system. In addition, notices will be broadcast through local television, radio and newspapers. Enforcement of the water restrictions will be the responsibility of the Raymond Police Department.

Nothing in this Plan precludes the Town from implementing more restrictive water use actions on its own initiative.

Whenever operational considerations of the water system allow during periods when voluntary outdoor water use restrictions are recommended or during a ban on outdoor water use, the Town will manage pumping from the three water supply wells to further minimize potential impacts to the Lamprey Designated River. This includes minimizing the withdrawal of groundwater from the well located closest to the river, balancing this reduction with increased pumping from the well farthest from the river, and operating the withdrawal at lower withdrawal rates over longer periods of time in preference to higher withdrawal rates for shorter periods.

Recordkeeping

Recordkeeping by Affected Water Users and Affected Dam Owners shall include documentation of the actions and the dates and times that management actions were taken to meet their Water Management Plans. This documentation shall include records of conditions affected by the management activities, including but not limited to changes in dam gate conditions, number of stoplogs in place, static water levels in impoundments, and pumping rates. From time to time and subject to available appropriations, DES will conduct audits of the management activities taken by the Affected Water Users and Affected Dam Owners in response to protected stream flow conditions. These records will be retained and made available to DES on request. DES recommends, but does not require, that Affected Water Users and Affected Dam Owners create and retain documentation of the costs associated exclusively with water management activities defined by their Water Management Plans.

Estimated Water Use Plan Implementation Costs

The water use management actions are the implementation of Raymond's outside water use reductions or bans applied when flows on the Lamprey Designated River fall below the Rare protected instream flow levels during summer and early fall during periods exceeding their Catastrophic duration. There are no additional direct costs associated with the implementation of these water use management actions.

Water Use Management Plan Implementation Schedule

By June 1, 2014, the Town will implement its Water Use Plan and will institute the measures for the management of outdoor water use during the summer and early fall when flows on the Lamprey Designated River fall below the Rare protected instream flow levels. The Town will update this Plan in response to any applicable changes in the state's Rules for the Protection of Instream Flow on Designated Rivers (Env-Wq 1900).

Water User Contact Information

Water User: Raymond Water Department
Address: 4 Epping Street, Raymond, NH 03077
Contact: Patrick Bower, Public Works Director
Phone: 895-4735 ext. 108
Email: pbower@raymondnh.gov

Conversion Factors for Volume and Flow Units			
1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	cfs =	448.86	gpm
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

Sources of Information

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/29/03.

Department of Environmental Services (DES) 2009a. Effects of Well Withdrawal Impacts on Lamprey River Stream Flow. NHDES-R-WD-09-5. Prepared by Normandeau Associates, Inc., Rushing Rivers Institute and the University of New Hampshire.

Department of Environmental Services (DES) 2009b. Final Lamprey Protected Instream Flow Report. Prepared by Normandeau Associates, Inc., Rushing Rivers Institute and the University of New Hampshire. NHDES-R-WD-08-26.

Town of Raymond 2009. Emergency Plan. Town of Raymond, Public Works Department, Water Division.

Survey of Lamprey River Affected Water Users performed by Normandeau Associates, Inc. and completed by Dennis McCarthy.

Personal communication with Dennis McCarthy, Town of Raymond.

Personal communication with Norm Dionne, Town of Raymond.

Water use reports on file with the Department of Environmental Services (DES).

WATER USE PLAN

Scenic Nursery & Landscaping (#20747)

Introduction

The following Water Use Plan (WUP) has been prepared for Scenic Nursery & Landscaping (Scenic Nursery), which is located in Raymond, New Hampshire. Scenic Nursery has three registered water sources, which include an overburden groundwater well near the Lamprey River, a temporary direct withdrawal from the Lamprey River and a withdrawal from a pond located along the Lamprey River.

Under the Instream Flow Rules (Chapter Env-Wq 1900) Scenic Nursery is considered an Affected Water User because its registered water sources are within 500 ft of a tributary to the Lamprey Designated River. In addition, its registered water sources are within the Lamprey River Water Management Planning Area (“Planning Area”), which is the watershed area of the Lamprey Designated River. Under Chapter Env-Wq 1900, individual WUPs are to be prepared for each Affected Water User located within the Lamprey River Planning Area. Each individual WUP is to include:

- Water use data and information to define water use patterns and needs for each Affected Water User;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan for each Affected Water User; and,
- An implementation schedule for the individual WUP.

Water Source and Uses

Scenic Nursery has three registered water sources on its property. The first source is a 15 foot deep dug well (20747-S01) that is located within 70 feet of the river. The second source is a dug well (20747-S02), but due to excessive siltation problems, this well is currently not being used. In its place, an intake pump was placed in the river and the piping from the temporary intake ties into the irrigation system piping in the former dug well. The third water source (20747-S03) is a small pond located in the northwest portion of the property. The pond measures approximately 130 by 80 feet and is reportedly 5 feet deep.

Scenic Nursery is a full service garden center and nursery, which also provides landscape design services. The water withdrawn from the three registered sources is used to water annual plants in a greenhouse as well as approximately seven acres of container and field grown nursery stock (trees and shrubs). Most of the watering is done by a drip irrigation system, while there is some blanket watering by spray irrigation of the container plants.

Water Use Patterns

Water use is primarily during the spring through fall, with no reported water use during the winter (November through February). Their water use is dependent upon plant needs and is mostly affected by weather conditions (rainfall and air temperature). The greatest use of water is in dry periods during which water use can be 24 hours a day, seven days a week. During these periods automated watering occurs from 6 pm to 8 am, followed by manual watering from 8 am to 6 pm.

Scenic Nursery's water withdrawals were first registered with DES in July 2001. Water use is measured based on pump run time, totaled monthly and reported to DES quarterly. Water use data for Scenic Nursery for the years of 2002 through 2012 (except for 2009 when no data is available) were obtained from DES and are summarized in the figures and tables below.

Between 2002 and 2012 annual water use by Scenic Nursery ranged from a high of 4.032 million gallons (2007) to a low of 370,000 gallons (2004), with an average annual use of 1.377 million gallons (Figure 1 and Table 1). The high water use reported in 2002 reflects the drought conditions experienced in 2001 and 2002, while the high water use reported in 2007 reflects the recovery from the flood during April that year. According to the owner, most of the nursery stock was destroyed or washed away during the flood and several years of product had to be replaced. The new above ground stock required more watering, by spray irrigation, until they were replanted into more permanent containers in a pot-to-pot system, which utilizes drip irrigation. The significant decline in water use from 2007 to 2008 reflects the reduced water use due to the establishment of the new plant stock and the reduced reliance on spray

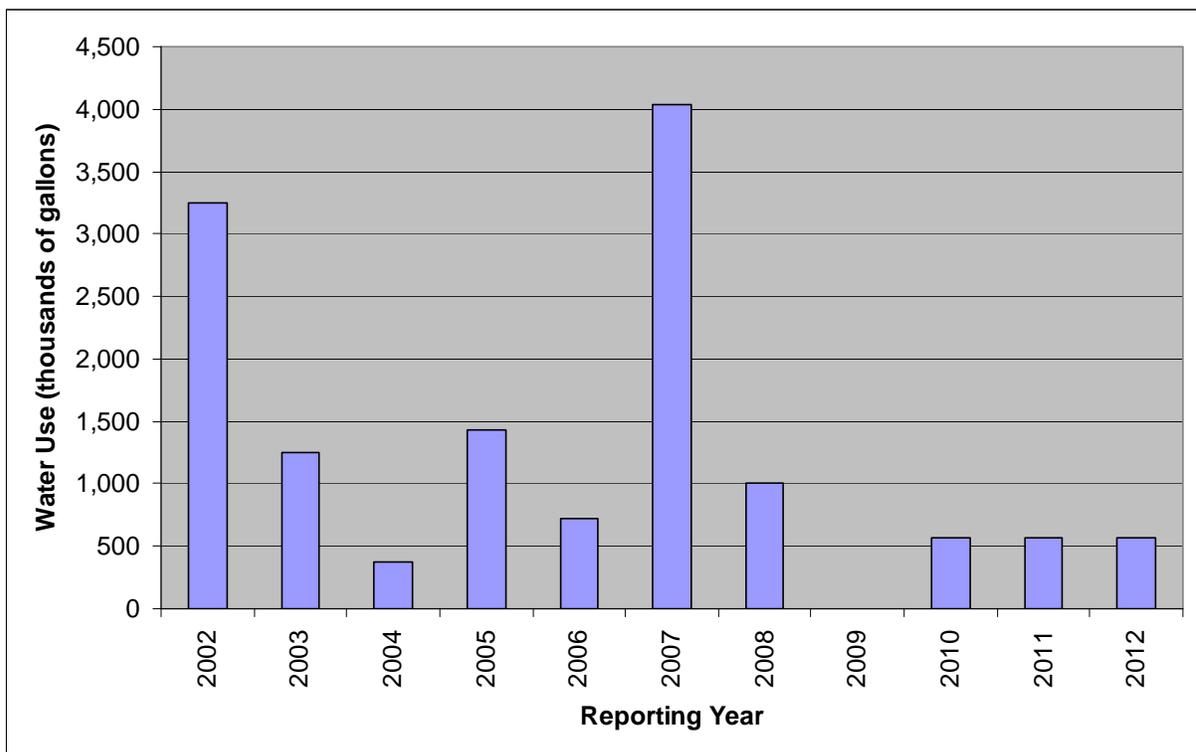


Figure 1 - SCENIC NURSERY - Annual Water Use (2002-2012, no data in 2009)

Table 1 - Scenic Nursery's Annual Water Use Statistics (2002-2012, no data in 2009)

	Low	High	Average
Thousands of Gallons	370	4,032	1,377
cfs	0.0016	0.0171	0.0058
cfsm at Packers Falls Gage	0.00001	0.00009	0.00003

irrigation (Figure 1). Scenic Nursery reduced their annual water use after 2009 by harvesting one of their field grown plant fields and discontinuing its use. They also continued their efforts to reduce water usage through use of water efficient systems and reducing crop water requirements.

Overall, the trend in annual water use from 2002 through 2012 decreased by 2.69 million gallons or 83 percent. This represents an average decrease of 244,000 gallons per year or 7.5 percent per year over the eleven year period of record.

Monthly water use varies in response to weather conditions and plant water demands. There has been no reported water use during the months of November through February due to winter conditions (Figure 2). Mean monthly water use gradually increases from March to a peak in August, in response to high plant irrigation demand, and then declines back to zero by November. The highest monthly water use was 1.008 million gallons in July and August 2007 (Figure 2 and Table 2). The high water use during these months is related to the recovery of the nursery operations after the April 2007 flood. The average monthly water use for the period of 2002 through 2012 was 144,730 gallons. The average monthly water use during the active usage months (March – October) was 172,095 gallons/month or .0089 cfs (5,661 gallons per day).

The monthly water use data for Scenic Nursery were converted from thousands of gallons per month to cubic feet per second (cfs) by dividing the monthly values by days and then multiplying this result by a flow unit conversion factor. These values were also divided by the drainage basin area (183 sq. miles) relative to the location of the United States Geological Survey (USGS) gaging station (0173500) on the Lamprey Designated River at Packers Falls near Newmarket. They were also normalized to the drainage area (153 sq. miles) above the start of the Designated Reach (impact point) at the Lee/Durham town line.

Based on these values, water use by the Scenic Nursery has ranged from a minimum of 0 cfs (November through February in all years) to a maximum of 0.05 cfs (32,576 gallons per day, July and August 2007), with an average of 0.007 cfs (2,392 gallons per day) for 2002 through 2008.

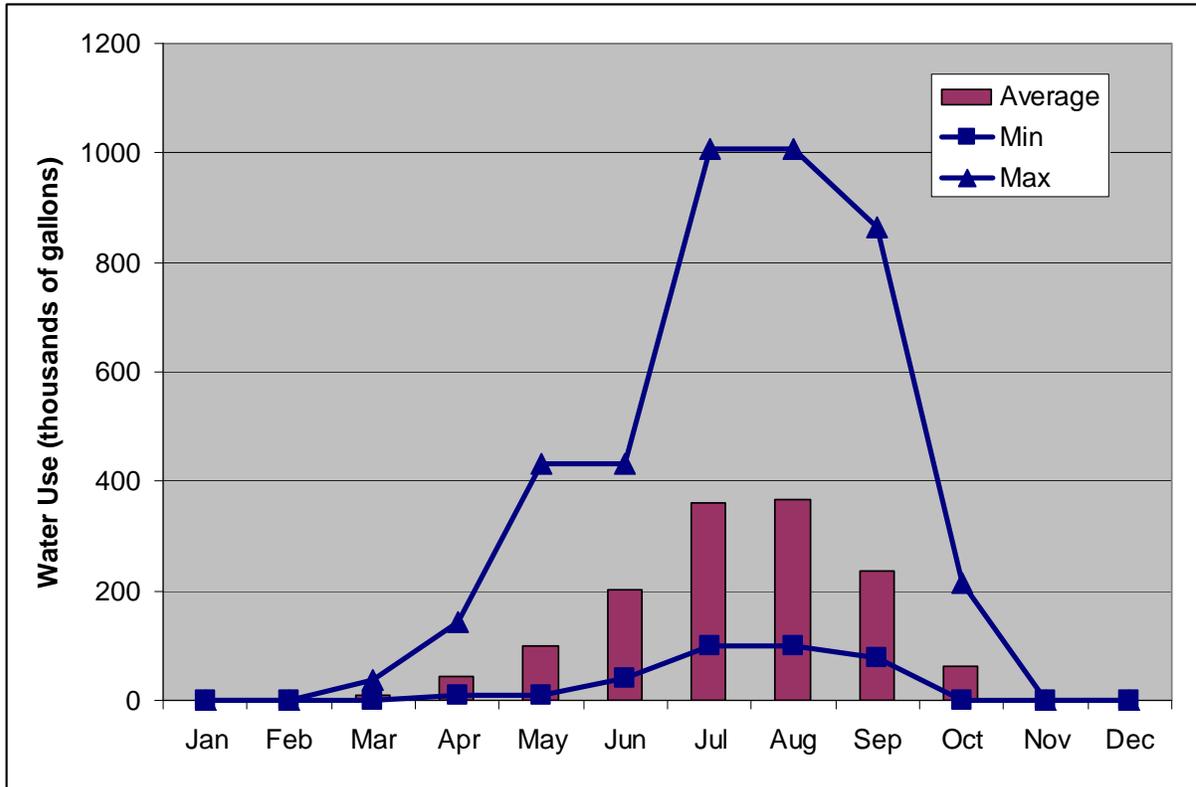


Figure 2 - SCENIC NURSERY - Monthly Water Use (2002-08 and 2010-12)

Table 2 - Scenic Nursery - Monthly Water Use Statistics (2002-08 and 2010-12)

	Low	High	Average
Thousands of Gallons	-	1,008	115
cfs	-	0.0513	0.0058
cfsm at Packers Falls Gage	0.00000	0.00028	0.00003

Potential for Water Use Management to Meet Protected Instream Flows

The potential for water use management at Scenic Nursery to meet the protected instream flows is considered low. This is due to the low volume of water used by Scenic Nursery for their operations. Based on a review of the historical water use by Scenic Nursery, their maximum average daily use is equivalent to 0.05 cfs, which was related to higher than average irrigation use to establish new plants during the recovery of their operations following a significant flood event in 2007. Otherwise, their highest use, 0.02 cfs, occurred in August 2002 during a drought.

Maximum monthly water use for 2010 through 2012 was 156,000 gallons. Because of their reduced water usage, Scenic Nursery's water use since 2008 has been below the registration and reporting threshold for monthly water use (600,000 gallons per month). If Scenic Nursery demonstrates that it also uses less than 140,000 gallons per week, they would no longer be

considered an Affected Water User and would be exempt from the Instream Flow Rules requirements.

Water Use Plan Activity

Although the overall water use by Scenic Nursery is low, it utilizes a temporary direct withdrawal from the Lamprey River for irrigation, a consumptive use. During periods when flow on the Lamprey Designated River falls below the Rare flow condition (16 cfs as measured at the United States Geological Survey gaging station 0173500 Lamprey River near Newmarket) during the period of June 20 to October 6 (Rearing and Growth Bioperiod, DES 2009), Scenic Nursery will limit its direct withdrawal from the Lamprey River to its share of the *de minimis* flow available under the Instream Flow Rules (Env-Wq 1903.01).

As noted in the Lamprey Protected Instream Flow Report, the *de minimis* allowable withdrawal from the Lamprey River is 0.21 cfs, or 135,725 gallons per day, under any flow condition. In the Lamprey Water Management Plan, the *de minimis* is apportioned between the two surface water withdrawals at Scenic Nursery (20747-S02) and the University of New Hampshire/Durham Water System (UDWS) withdrawal (20066-S02). Under current water demands, approximately 0.01 cfs (6464 gallons per day) from surface water is available to Scenic Nursery and approximately 0.20 cfs (129,272 gallons per day) is available to UDWS under the *de minimis* withdrawal. The relative availability of the *de minimis* withdrawal may be impacted by future demands by other affected water users, and thus is subject to change. Use of only the *de minimis* amount will be rescinded when natural rainfall events result in daily mean discharge exceeding 18 cfs for two consecutive days.

The prompts for these water use plan actions are determined from flow measurements at the USGS gaging station 0173500 Lamprey River near Newmarket. Flow data can be found at http://waterdata.usgs.gov/nh/nwis/dv/?site_no=01073500&agency_cd=USGS&referred_module=sw. The actions in this Water Use Plan are based on mean daily flow conditions recorded at this gage or based on conditions defined on the DES Instream Flow Program website.

Recordkeeping

Recordkeeping by Affected Water Users and Affected Dam Owners shall include documentation of the actions and the dates and times that management actions were taken to meet their Water Management Plans. This documentation shall include records of conditions affected by the management activities, including but not limited to changes in dam gate conditions, number of stoplogs in place, static water levels in impoundments, and pumping rates. From time to time and subject to available appropriations, DES will conduct audits of the management activities taken by the Affected Water Users and Affected Dam Owners in response to protected stream flow conditions. These records will be retained and made available to DES on request. DES recommends, but does not require, that Affected Water Users and Affected Dam Owners create and retain documentation of the costs associated exclusively with water management activities defined by their Water Management Plans.

Estimated Water Use Plan Implementation Costs

Limiting the direct withdrawal of water from the Lamprey River when flows fall below the rare flow condition during the summer and early fall to *de minimis* flow volumes will not result in any significant direct cost to Scenic Nursery.

Water Use Management Plan Implementation Schedule

By June 1, 2014, Scenic Nursery will institute the condition of limiting its direct withdrawal of water from the Lamprey River during the summer and early fall (Rearing and Growth Bioperiod) when flows on the Lamprey Designated River fall below the Rare flow condition (16 cfs) to its share of the *de minimis* value. Scenic Nursery will update this Plan in response to any applicable changes in the state's Instream Flow Rules (Env-Wq 1900).

Water User Contact Information

Water User: Scenic Nursery & Landscaping
Address: 9 Dudley Road, Raymond, NH 03077
Contact: Glenn Caron
Phone: 895-0236
Email: glenn@scenicnursery.net

Conversion Factors for Volume and Flow Units

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

Sources of Information:

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/29/03.

Department of Environmental Services (DES) 2009. Final Lamprey Protected Instream Flow Report. Prepared by Normandeau Associates, Inc., Rushing Rivers Institute and the University of New Hampshire. NHDES-R-WD-08-26.

Personal communication with Glenn Caron, Scenic Nursery & Landscaping.

Survey of Lamprey River Affected Water Users performed by Normandeau Associates, Inc. and completed by Glenn Caron.

Water use reports on file with the Department of Environmental Services (DES).

WATER USE PLAN

University of New Hampshire/Durham Water System (#20066)

Introduction

The following Water Use Plan (WUP) has been prepared for the University of New Hampshire/Durham Water System (UDWS), which supplies water for the University of New Hampshire and for the Town of Durham, New Hampshire. The WUP was prepared using information provided by the UDWS and from their water use records reported to the Department of Environmental Services (DES). The UDWS has three registered water sources: the Lee Well, the Oyster River and the direct withdrawal from the Lamprey Designated River in Durham.

Because one of its registered water sources is located on the Lamprey Designated River, UDWS is considered to be an Affected Water User under the Instream Flow Rules (Chapter Env-Wq 1900). Under Chapter Env-Wq 1900, individual WUPs are to be prepared for each Affected Water User U located within the Lamprey River Water Management Planning Area (“Planning Area”). Each individual WUP is to include:

- Water use data and information to define water use patterns and needs for each Affected Water User;
- A description of the potential for water use modification, sharing or both to meet the protected instream flow requirements, including water use patterns and needs;
- An estimate of implementation costs of the plan for each Affected Water User; and,
- An implementation schedule for the individual WUP.

Water Source and Uses

The UDWS withdrawal from the Lamprey River is registered with DES as Water User ID #20066-S02. The pumping station and intake, which were constructed in 1970, are located in the reservoir approximately 2,700 feet upstream of Wiswall Dam. The original underground raw water main, also constructed in 1970, transferred water withdrawn at the pump station and discharged directly to the Oyster River at a location approximately 1 mile upstream from UNH’s Arthur Rollins Water Treatment Plant (ARWTP) in Durham. To improve the efficiency of the withdrawal, another raw water main was constructed in 2002, which was connected to the original pipe at an intermediate location and run directly to the ARWTP. This withdrawal improvement project, which also included upgrades at the pump station, allowed water withdrawn from the reservoir to be pumped directly to the ARWTP, thereby avoiding losses of the transferred water within the Oyster River and riparian wetlands. The Wiswall Dam, the Wiswall Reservoir and the intake are all located on the Lamprey Designated River.

From 1970 to 2002, withdrawals from the Lamprey River were directly transferred to the Oyster River supply source in times of drought. Water was not withdrawn from the Lamprey River on a regular basis because it was inefficient and increased the turbidity in the Oyster River making it difficult to treat. As a result, infrequent withdrawals were made when demand was high or the available supply from the Oyster River was limited. After 2002, with the direct connection between the Lamprey River and the ARWTP completed, more frequent water usage for trials and experimentation with the new system configuration occurred from 2002 until 2004. From 2004 through 2008 the use of the Lamprey River withdrawal was infrequent and sporadic while a variety of operational complications were resolved. In late 2008, the Lamprey River became the principal source of water for the UDWS. The water from both

the Lamprey and Oyster Rivers is treated at the ARWTP and then distributed to the water system, while the Lee Well, which represents 25-50 percent of the total supply depending on flow conditions, supplies the system directly.

Water Use Patterns

Lamprey River withdrawals are metered and withdrawal volumes are recorded daily and totaled monthly, with reports provided to DES on a quarterly basis. Water use data for the UDWS Lamprey River withdrawals for the years 1988 through 2012 were obtained from DES. From January 1988 through December 1992, there is no record of any Lamprey River water use. From January 1993 through December 2012, the monthly water use records are complete. The water use data are summarized in the figures and tables below.

From 1970 to 2008, withdrawals from the Lamprey River were sporadic due to the complexities described above. During this time, supply needs were usually met with withdrawals from the Oyster River and the Lee Well. Withdrawals from the Lamprey River typically began during August and September, when demand increases in response to the return of UNH students to Durham, and ended when demand decreased at the end of May with the conclusion of the UNH spring semester and decline in student population. Starting late in 2008, the Lamprey River became the principal source of water for the UDWS when flow on the Lamprey River exceeds 45 cfs. Water use beginning in 2009 reflects years under this change in priority of use. Water use data have been assessed separately for the period before and after 2009.

Annual water use from the Lamprey River from 1993 through 2008 has ranged from a high of 121.0 million gallons (2003) to a low of 0 gallons (multiple years), with an average annual use of 21.9 million gallons (Figure 1 and Table 1). Withdrawals from the Lamprey River were greater from 2002 through 2004 than during all other years. As described above, this was a result of trials and experimentation as the Lamprey River withdrawal was transitioned from a direct discharge to the Oyster River Reservoir to a direct connection with the ARWTP. This period also coincided with several summers of below normal discharge on the Lamprey and Oyster Rivers due to regional drought conditions. Between 1993 and 2008 water withdrawals from the Lamprey River were sporadic and have little correlation to UDWS overall water use patterns.

Between 2009 and 2012 when the Lamprey was used as the UDWS primary source, annual water use from the Lamprey ranged from a high of 178.3 million gallons (2009) to a low of 89.4 million gallons (2012), with an average annual use of 112.5 million gallons (Table 2).

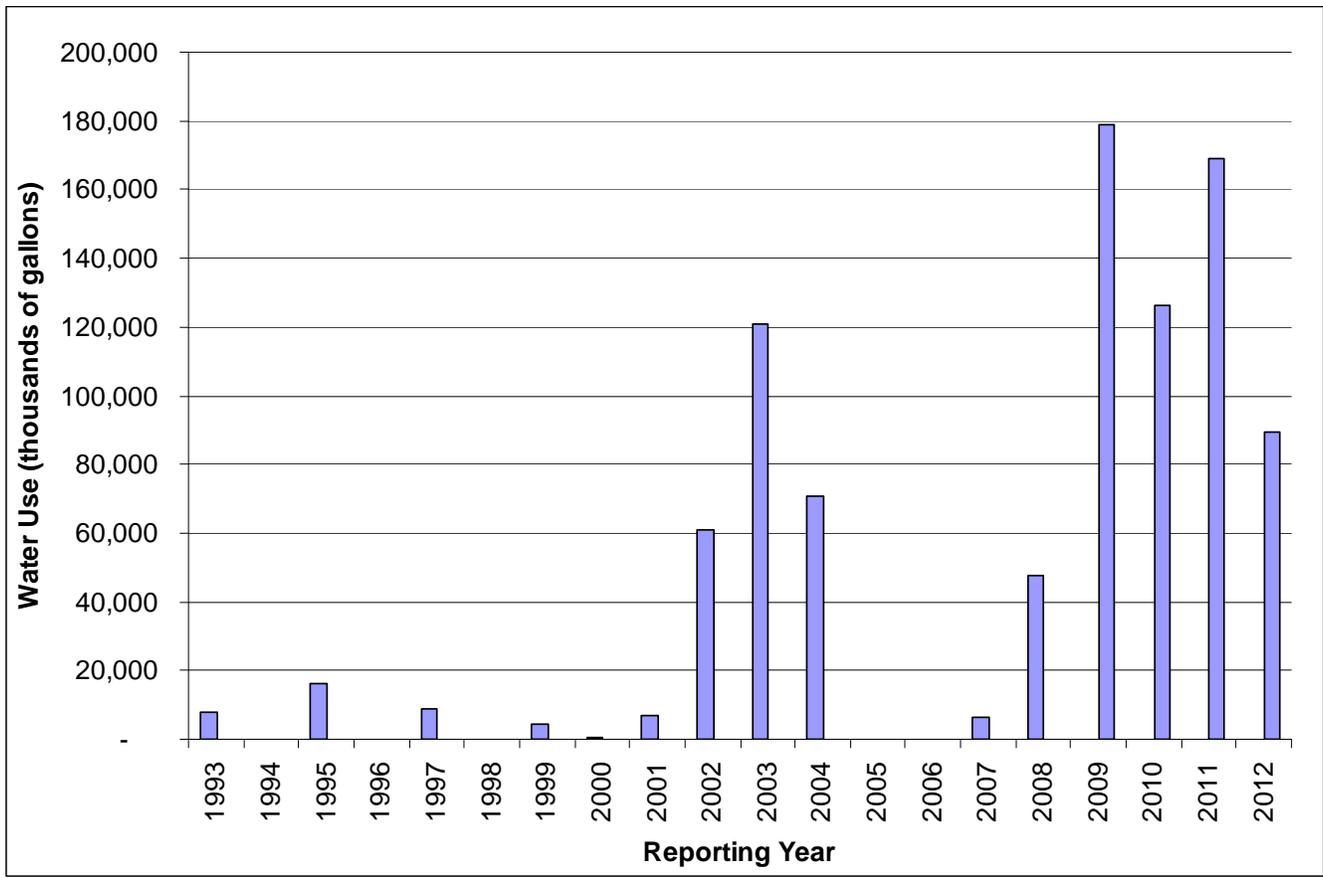


Figure 1 - UDWS - LAMPREY RIVER DIVERSION (20045-S02) - Annual Water Use (1993-2012)

Table 1 - UDWS - Lamprey River Diversion Annual Water Use Statistics (1993-2008)

	Low	High	Average
Thousands of Gallons	-	-120,905	-21,963
cfs	-	-0.5125	-0.0931
cfsm at Packers Falls Gage	0.00000	0.00280	0.00051

Table 2 - UDWS Lamprey River Diversion Annual Water Use Statistics (2009-2012)

	Low	High	Average
Thousands of Gallons	89,631	178,760	140,948
cfs	0.3800	0.7578	0.5975
cfsm at Packers Falls Gage	0.00208	0.00414	0.00327

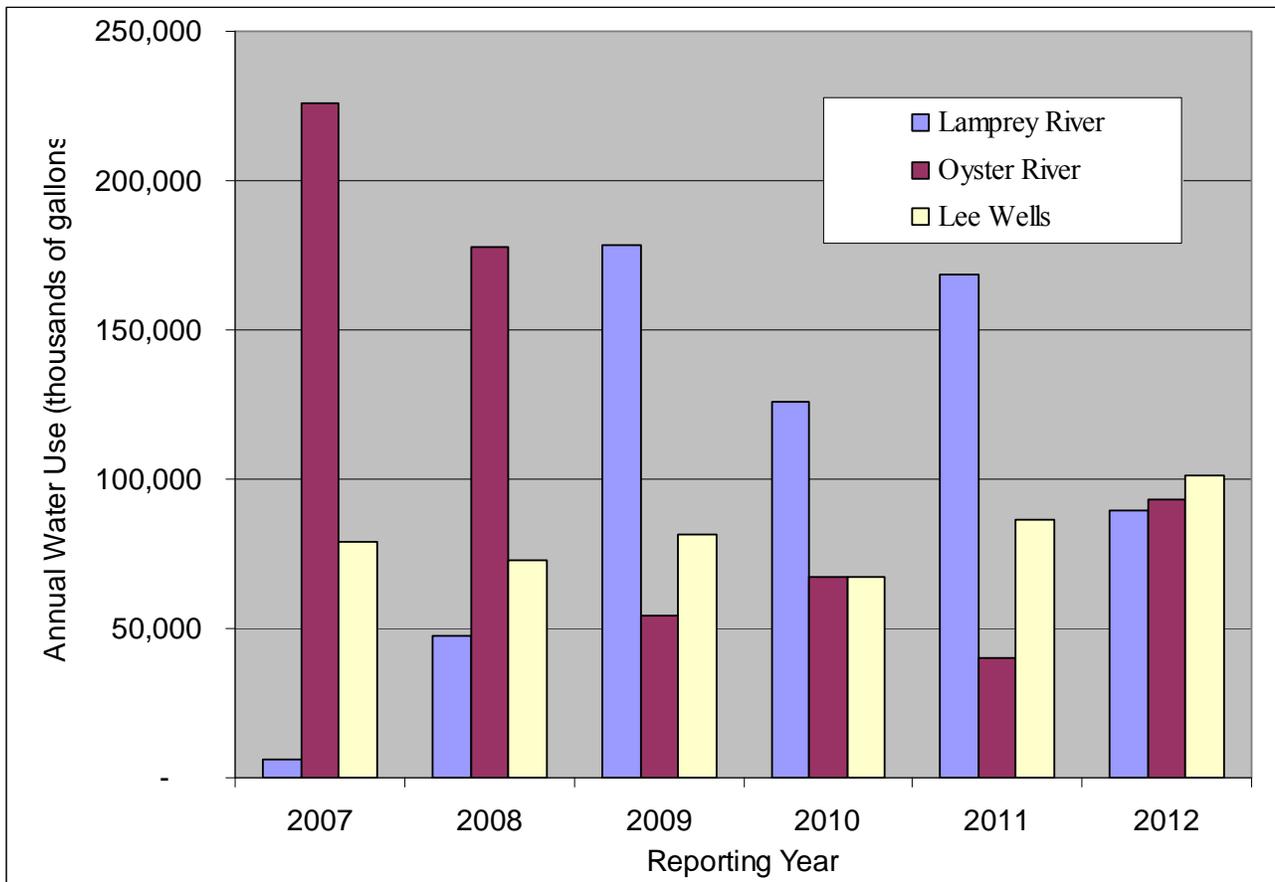


Figure 2 - UDWS (20066) Change in Total Annual Water Use by Sources (2007-2012)

Monthly water use from the Lamprey River from 1993 through 2008 was highly variable due largely to seasonal demand, but was also affected by weather conditions and the availability of water from the Oyster River. The total and average monthly water usage during this time period was greatest during the summer and fall and lowest during the winter (Figure 2). This seasonal use pattern reflects increased use of the Lamprey River due primarily to the return of students to UNH in the fall, and summer droughts which limited water availability and quality in the Oyster River. From late 2008, the Lamprey was used as UDWS’s primary source. Monthly water use during 2009 through 2012 were also variable, but on average reflected use related to increased demand changes during the school year and reduced use of the Lamprey during the summer low flows because of use of the UDWS’s alternative sources.

The highest monthly usage from the Lamprey River during the period 1993-2008 was 21.480 million gallons (October 2003), while no water use was reported for multiple months during multiple years (Table 3). The average monthly usage from the Lamprey River was 1.83 million gallons for the period January 1993 through December 2008. As described above, between 2002 and 2008, the UDWS was in a period of transition, evaluating the Lamprey River withdrawal and optimizing treatment methods at the Water Treatment Plan. This resulted in sporadic usage which provides limited ability to predict future use patterns.

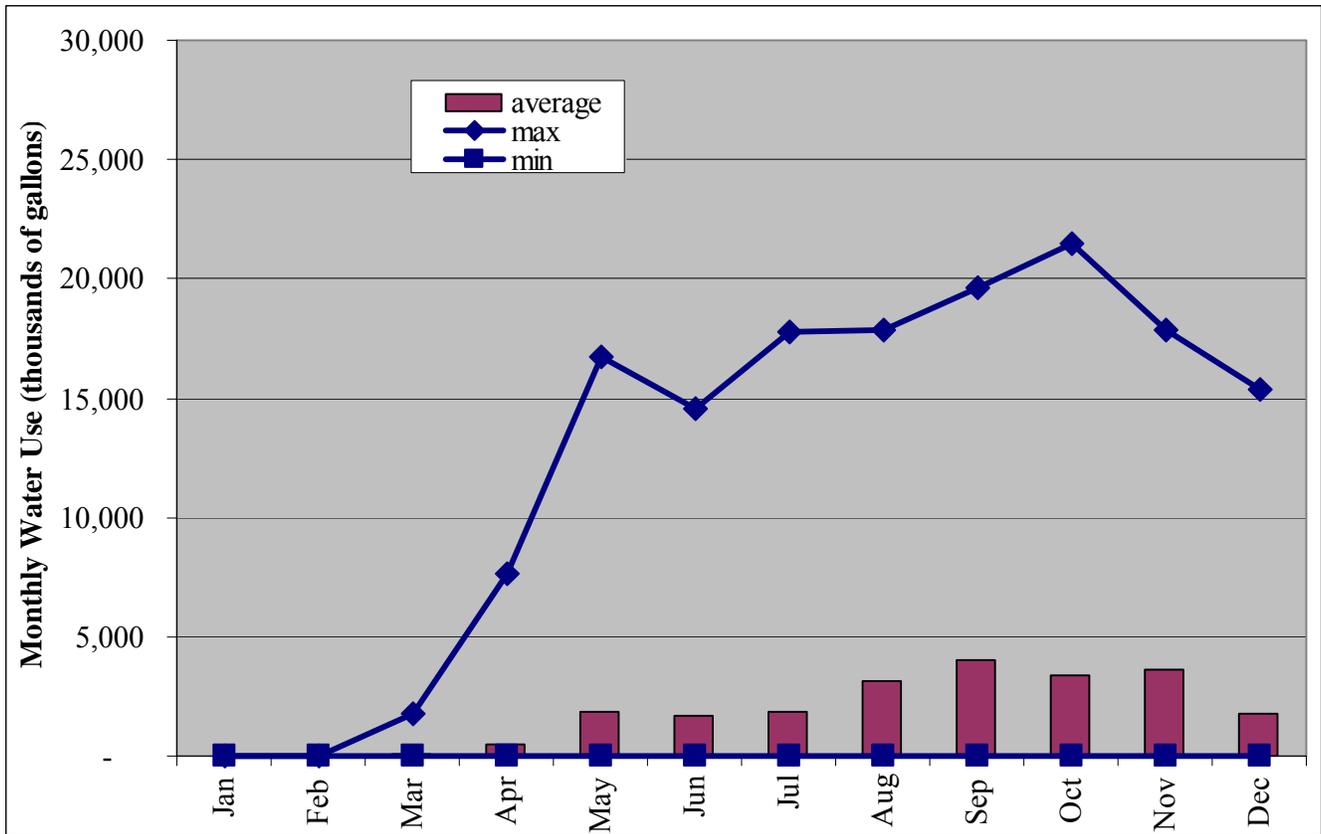


Figure 3 – UDWS - LAMPREY RIVER DIVERSION - Monthly Water Use (1993-2008)

Table 3 – UDWS - Lamprey River Diversion - Monthly Water Use Statistics (1993-2008)

	Low	High	Average
Thousands of Gallons	-	-21,480	-1,825
cfs	-	-1.0927	-0.0929
cfsm at Packers Falls Gage	0.00000	0.00597	0.00051

Table 4 shows the highest monthly usage from the Lamprey River (2009-2012) was 23.955 million gallons (September 2011), while no water use was reported for several months during several months of these years. The average monthly usage from the Lamprey River was 11.714 million gallons for the period. In general, the monthly water use is likely to follow the pattern shown in Figure 4.

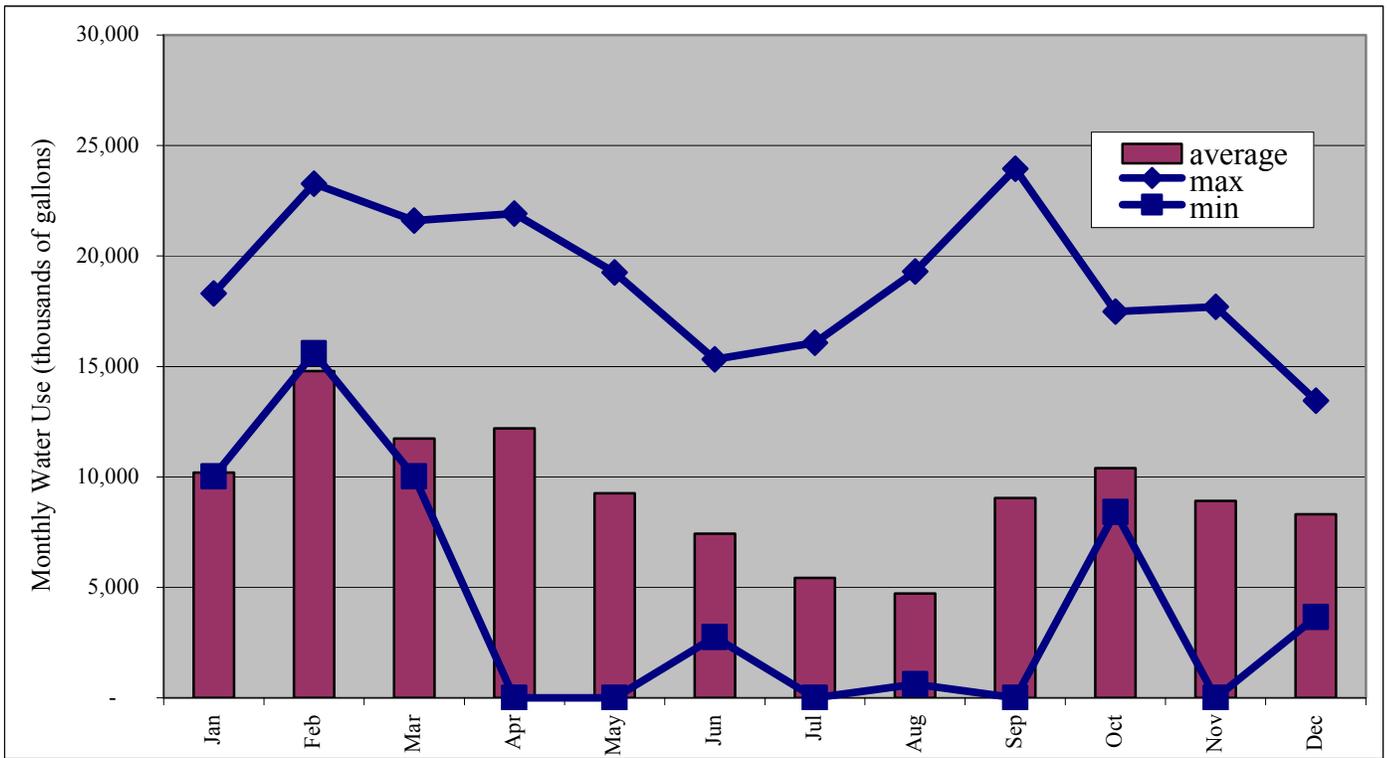


Figure 4 - UDWS - Lamprey River Diversion Monthly Water Use (2009-2012).

Table 4 - UDWS - Lamprey River Diversion Monthly Water Use Statistics (2009-2012).

	Low	High	Average
Thousands of Gallons	-	23,955	11,714
cfs	-	1.2186	0.5959
cfsm at Packers Falls Gage	0.00000	0.00666	0.00326

The monthly water use data were converted to flow in cubic feet per second by dividing the monthly values by days and then multiplying this result by a flow unit conversion factor. Based on these monthly values over the period 1993 to 2008, the average daily water use of the Lamprey River pump station has ranged from a minimum of 0 cfs (multiple occurrences) to a maximum of 1.093 cfs (0.767 million gallons per day, October 2003) with a mean monthly water use of 0.093 cfs (65,188 gallons per day). Based on monthly values for the period 2009 to 2012, the average daily water use of the Lamprey River pump station has ranged from a minimum of 0 cfs (multiple occurrences) to a maximum of 1.22 cfs (0.856 million gallons per day, September 2011), with a mean monthly water use of 0.67 cfs (385,062 gallons per day). Again, it should be noted that withdrawals from the Lamprey River for most of the record were not continuous, so the average includes long periods when no water was withdrawn.

Potential for Water Use Management to Meet Protected Instream Flows

The UDWS has the potential to manage water use to support the Protected Instream Flows due to the availability of multiple water sources and the potential for reducing system water demand through the use of water conservation measures. The alternative sources include the Oyster River Reservoir, the Lee Well, and storage in the Wiswall Reservoir. The UDWS also has an established Emergency Response Plan that includes a multi-stage, outside-water-use plan to reduce system demand during periods of drought.

The capacity of the UDWS pump at the withdrawal from the Lamprey Designated River is 2.8 cfs (1.8 million gallons per day.) Withdrawals have the greatest impact during periods when stream flow is lowest, which typically occurs during the months of August and September. August and September also happen to be when water demand by UDWS increases due to the arrival of UNH students to begin the fall semester.

The UDWS has alternative water sources available from the Oyster River and the Lee Well. The Oyster River reservoir has an estimated usable storage volume of 9 million gallons (Underwood Engineers, Inc. 2007). Water withdrawn from the Oyster River is treated and then distributed to the water supply system. The Oyster River watershed is more than ten times smaller than the Lamprey watershed and so has less water available for consumptive use. Due to the requirement for treatment, water supply from the Lamprey River and Oyster River is limited by the maximum capacity of the Arthur Rollins treatment plant, which is 1.55 million gallons per day. The Lee Well has an estimated sustainable yield of 0.54 million gallons per day and discharges directly into the water distribution system after disinfection.

The UDWS has an established Emergency Response Plan that includes a multi-stage, outside-water-use reduction and public awareness/voluntary conservation plan that applies during periods of drought. UDWS has indicated an interest and a willingness to meet reasonable reductions for outside water use during Plan-defined stream flow conditions in order to reduce system demand and support the protected flows.

This Water Use Plan must be coordinated with the Dam Management Plan developed for the Wiswall Dam (State Dam ID #071.04).

Water Use Plan Actions

The main components of the UDWS Water Use Plan are listed below and described further in later paragraphs.

- Withdrawals affecting downstream flow may be limited or restricted during low flow conditions as defined by the Lamprey River Protected Instream Flow report.
- Withdrawals from reservoir storage are available so long as the Water Use Plan conditions for water level drawdown, rate of drawdown and downstream flow are effectively met.
- The UDWS will manage withdrawals from the Lamprey River in cooperation with the Town of Durham's operation of the Wiswall Dam to effectively maintain downstream flows and Reservoir operating conditions.
- The UDWS will acknowledge receipt of DES notifications when a relief flow release is to be made.

- During the relief flow releases, the UDWS will actively manage their withdrawal from the Wiswall Reservoir to ensure that inflow or sufficient flow to exceed the Critical Protected Flow magnitude is passed (as practicable given the requirements of the Wiswall Dam Management Plan).
- Summertime outside watering use restrictions and conservation measures as outlined in the Water Conservation Plan will be implemented when limited source water availability corresponds with low river flow periods in order to limit the impacts of water demands on the Lamprey River flow.
- The UDWS will have access to 0.20 cfs of the *de minimis* flow of 0.21 cfs, until such time as other users in the designated river segment covered by the Lamprey River Protected Instream Flow require some portion of that *de minimis* flow.
- Longer periods at lower pumping rates will be the preferred operational procedure for withdrawals from the Lamprey River especially during instream flow management events.

The USGS gaging station on the Lamprey River near Newmarket (0173500) located at Packers Falls provides the flow measurements which trigger the Water Use Plan actions as described in this document. The UDWS will monitor flow conditions and act on the Water Use Plan based on mean daily flow conditions recorded at this gage.

Per RSA 483:9-c, IV, "... when the commissioner determines that a public water supply emergency exists which affects public health and safety" the protected instream flow is not required to be maintained. As such, during such an emergency, the conditions in this plan will be set aside until conditions allow for the provisions of the Water Use Plan to resume. If the UDWS experiences conditions which may adversely affect public health and safety, then the UDWS will declare to the Commissioner of DES that it is experiencing a water supply emergency and may take immediate remedial measures in accordance with the UDWS Emergency Response Plan. Upon such declaration, the UDWS will provide the Commissioner with a written description of the factors that resulted in the emergency, the proposed remedial measures, and an estimation of expected duration and corrective action being taken. Factors leading to a water supply emergency could be, but are not limited to, major operational or equipment failures, natural or environmental disasters, acts of terrorism, or unforeseen events or conditions that cause a system-wide water shortage resulting in Stage 4 status, as defined in the UDWS Emergency Response Plan. In addition, the governor may establish a state of emergency per RSA 4:45 which could also suspend the requirements of this plan. During the emergency, the UDWS shall maintain written records of: river flow at the USGS Lamprey River near Newmarket gage; start and end dates and times of uniform withdrawal rates and the pumping flow rate; daily withdrawal volumes from all sources; date and time of beginning and end of emergency conditions; reasons for the emergency; and the name and office of the public official who declared the emergency. Within 60 days of the end of emergency operations, the UDWS shall file with DES a report describing the cause(s) of the emergency and water use and Lamprey withdrawal conditions on a daily basis, including the times and amounts of water withdrawal and reservoir water levels and rates of change. Unless the emergency was caused by one-time, non-recurring circumstances such as fire or a contamination event, the report will detail specific steps to be taken by the UDWS to avoid recurrence of emergency conditions.

The UDWS withdrawal on the Lamprey River (20066-S02) may be operated at up to its maximum pumping capacity of 2.8 cfs when stream flow is greater than or equal to 16 cfs. When stream flows in the Lamprey are below 16 cfs, the UDWS will balance its other water sources with Lamprey River withdrawals so as to satisfy the protected instream flow requirements and meet the minimum UDWS demands. The UDWS may withdraw water from Wiswall Reservoir storage so long as Wiswall Reservoir operating conditions under its Dam Management Plan are effectively met.

Outside water use is typically heaviest during the summer and early fall. Plans for outside water use reduction will be applied during the two bioperiods (June 20 through October 6). Summertime outside water use reductions and calls for conservation measures as outlined below will be implemented by the UDWS to reduce the impact of outside water use on the Lamprey River and the UDWS water supply during defined flow and water system conditions. Measures to reduce outside water use will be implemented as part of the UDWS Emergency Response Plan (UNH/Durham Water Supply). The most recent version of the plan dated 2009 meets the requirements of the Water Management Plan. At the writing of this document, the Emergency Response Plan and Conservation Plans are being integrated under the auspices of Env-Wq 2101. Once this plan is approved by DES, it will replace the 2009 version. Subsequent revisions will be approved by DES as required by administrative rule. Under this Water Use Plan, the goal of reducing outdoor water use will be accomplished in four water conservation stages based on Lamprey River flow and system demand as compared to the maximum available capacity of the combined system source water. Maximum available capacity¹ is defined as the amount of water available to the UDWS from the system's combined water sources on a given day.

The Lamprey River Water Management Plan includes a Conservation Plan for UDWS which details the conservation practices and the outreach efforts needed to implement those practices. The four water conservation stages progress from alert messages and voluntary measures under Stage 1 to a mandatory ban on outside water use and broader restrictions under Stage 4 per UDWS Emergency Response Plan (2009 or most recently DES-approved Conservation Plan) are described below:

Stage 1 Alert. The first action is an alert that voluntary water conservation measures should be taken and further actions may begin soon. The alert will be announced by the UDWS no later than on the day after daily mean discharge at the gage falls below 16 cfs (the rare protected flow level) and when system demand is $\geq 75\%$ of the maximum available capacity. The UDWS will inform its water users through its notification process that it is necessary to implement voluntary water conservation measures and prepare for further actions as described in **Stage 1** of the Emergency Response Plan. An alert is rescinded when daily mean discharge exceeds 25 cfs for two consecutive weeks.

Stage 2 Alert. When daily mean discharge in the Lamprey Designated River continues to decline and fall below the Critical protected flow level of 16 cfs for longer than 15 days, and when system demand is $\geq 80\%$ of the maximum available capacity, then UDWS will implement outside water use restrictions as described in **Stage 2** of the Emergency Response Plan. These restrictions include, but are not limited to, a ban on vehicle washing and swimming pool filling, and limited watering of lawns and gardens. These restrictions will be rescinded when daily mean discharge exceeds 16 cfs for five consecutive days.

Stage 3 Alert. When daily mean discharge in the Lamprey Designated River falls below the Rare protected flow level of 16 cfs during this period for longer than 20 days, and when system demand is $\geq 85\%$ of the maximum available capacity, then the actions described under **Stage 3** of the Emergency Response Plan will be imposed, including, but not limited to, bans on vehicle washing, swimming pool filling, and watering of lawns and limited watering of vegetable gardens. These

¹ Note regarding calculation of maximum capacity: The UDWS will continue to involve DES in the development of the algorithm to calculate this value.

restrictions on outside water use will be rescinded when daily mean discharge exceeds 16 cfs for two consecutive days.

Stage 4 Alert. When daily mean discharge in the Lamprey Designated River falls below the Rare protected flow level of 16 cfs during this period for longer than the 25 days, and when system demand is $\geq 90\%$ of the maximum available capacity, and/or the UDWS declares and the Commissioner determines that a water supply emergency exists, then a complete ban on outdoor water use will be imposed as described under **Stage 4** of the Emergency Response Plan, including, but not limited to, bans on vehicle washing, swimming pool filling, and lawn and garden watering. These restrictions on outside water use will be rescinded when daily mean discharge exceeds 16 cfs for two consecutive days.

Adaptive management will be applied to evaluate the timing of implementation of water conservation stages. The UDWS continues to review and refine the demand-to-capacity ratios defining the Stage conditions used to initiate the outside water use reductions. DES and the UDWS will evaluate the effectiveness of these magnitudes in starting and ending outside water use reductions appropriate to protect water resources and meet the UDWS's water needs through their critical period of August 15 through October 15. The UDWS and DES will evaluate the applied management during the summers of 2013 and 2014, and beyond if more examples are needed. Similarly, the UDWS will further develop algorithms to define the demand-to-capacity ratio values. The algorithms will be fully reviewed and revised with DES support. Careful review and analysis of the management techniques and Emergency Response Plan may lead to improvement to operations by changing the timing of withdrawals from different sources and revision of the capacity ratios.

As noted in the Lamprey Protected Instream Flow Report, the *de minimis* allowable withdrawal from the Lamprey River is 0.21 cfs under any flow condition. Under current water demands, approximately 0.20 cfs is available to UDWS under the *de minimis* withdrawal. UDWS is one of two direct surface water withdrawals in the Lamprey tributary system. The relative availability of the *de minimis* withdrawal to the UDWS may be impacted by future demands by other affected water users, and thus is subject to change.

Whenever operational considerations of the water treatment plant, pumping station, water use, or other pertinent factors will allow, the UDWS will operate the Lamprey River withdrawal at lower withdrawal rates over longer periods in preference to higher withdrawal rates for shorter periods.

Whenever operational considerations of the water treatment plant, pumping station, water use, or other pertinent factors will allow, the UDWS will operate surface water withdrawals to take make use of high flows so that their groundwater sources are rested by operating at lower rates to preserve the capacity of their groundwater sources.

Nothing in this plan precludes the UDWS from implementing more restrictive water use actions on its own initiative.

Recordkeeping

Recordkeeping by Affected Water Users and Affected Dam Owners shall include documentation of the actions and the dates and times that management actions were taken to meet their Water Management Plans. This documentation shall include records of conditions affected by the management activities,

including but not limited to changes in dam gate conditions, number of stoplogs in place, static water levels in impoundments, and pumping rates. From time to time and subject to available appropriations, DES will conduct audits of the management activities taken by the Affected Water Users and Affected Dam Owners in response to protected stream flow conditions. These records will be retained and made available to DES on request. DES recommends, but does not require, that Affected Water Users and Affected Dam Owners create and retain documentation of the costs associated exclusively with water management activities defined by their Water Management Plans.

Estimated Water Use Plan Implementation Costs

The management activities would be performed by UNH and Town staff and/or a consultant and the annual costs to implement and maintain the water use plan is expected to range from \$10,000 to \$30,000.

To implement this Water Use Plan, the UDWS will update its Draft Lamprey Flow Monitoring Plan dated August 25, 2009. The Town will provide DES with standard operating procedures (SOP) for the operation of the dam under protected flow conditions. The purpose of the SOP is to implement accurate measurements of inflow to the Wiswall Reservoir to determine and meet conditions for Reservoir outflow management. The UDWS installed a water level gage in the Wiswall Reservoir to provide remote measurements of the reservoir level in order to manage withdrawals according to this plan. The UDWS will also develop either a flow measurement at the outlet of the Wiswall Dam or use the USGS gage Lamprey near Newmarket to provide accurate reservoir outflow data with which to manage withdrawals. The estimated cost for the design and installation of these gages is \$10,000 to \$50,000, depending upon the technology used to record and transmit the water level data.

Water Use Management Plan Implementation Schedule

By June 1, 2014, the UDWS will implement its Water Use Plan and will institute the proposed measures for the management of outdoor water use during the summer and early fall when flows on the Lamprey Designated River fall below the Rare protected instream flow levels.

Water User Contact Information

Water User: University of New Hampshire/Town of Durham Water System

Address: Town of Durham Department of Public Works
100 Stone Quarry Drive, Durham, NH 03824

Contact: David Cedarholm, Town Engineer

Phone: 868-5578

Email: dcedarholm@ci.durham.nh.us

Address: UNH Energy and Utilities
17 Leavitt Lane, Durham, NH 03824

Contact: Jim Dombrosk, Director Energy and Utilities

Phone: 862-2345

Email: jim.dombrosk@unh.edu

Conversion Factors for Volume and Flow Units

1	cubic foot =	7.481	gallons
1	gallon =	0.1337	cubic feet
1	acre-foot =	43,560	cubic feet
1	acre-foot =	325,872	gallons
1	cfs =	448.86	gpm
1	cfs =	646,358.4	gpd
1	cfs =	0.65	MGD
1	gpm =	0.002227866	cfs
1	gpd =	0.00000154713	cfs
1	MGD =	1.5471	cfs

Sources of Information

Env-Wq 1900 Rules for the Protection of Instream Flow on Designated Rivers, effective 5/29/03.

Department of Environmental Services (DES) 2009. Final Lamprey Protected Instream Flow Report. Prepared by Normandeau Associates, Inc., Rushing Rivers Institute and the University of New Hampshire. NHDES-R-WD-08-26.

UNH/Durham Water Supply 2009. UNH/Durham Water Supply Emergency Response Plan. Prepared by Wesley R. East, Chief Operator. Original date August 2002 and Revised March 2009.

Personal communication with David Cedarholm, P.E., Town of Durham.

Personal communication with Wesley East. UNH/Durham Water System.

Survey of Lamprey River Affected Water Users performed by Normandeau Associates, Inc. completed by Wesley East. UNH/Durham Water System.

Underwood Engineers, Inc. 2007. Draft Update to Water Resources Management Plan Durham NH University of New Hampshire dated October 2007.

Water use reports on file with the Department of Environmental Services (DES).