

SUNAPEE NEWS-STREAM

Sunapee Watershed Infrastructure Project Updates & Highlights

Spring 2010

Contents:

Letter from LSPA 1

Note from Principal
Investigators 2

The Field Work 3

The Results 3

10/28 Stakeholder Forum
Highlights 4-5

Project Timeline 4

Feature Article: The
Importance of
Infrastructure 6

Key Terms 7

Rundown of Project
Team 7

Upcoming Events 8

Letter from the Lake Sunapee Protection Association

Residents and municipalities in the Lake Sunapee watershed will benefit from a recent grant award by the National Oceanic and Atmospheric Administration (NOAA). NOAA has awarded several New Hampshire and other researchers funding to investigate the adequacy of stormwater infrastructure in the fifty square mile watershed. The Sunapee area, like many regions in New Hampshire has experienced more frequent and more intense storm activity in the last 10 or more years. Combined with more development on the land, these storms have caused significant public infrastructure damage including road, bridge and culvert washouts.

For the Sunapee study, data on approximately 200 culverts (those passing under public roads) and other watercourse infrastructure have been

gathered. Rainfall data including precipitation projections based on climate change models, other hydrological data, development patterns, including increases in impervious surface and other land-use data will be used in the analysis

Additional analysis will estimate how much Low Impact Development (LID) techniques could reduce the impact of excessive runoff. And finally, an economic analysis will estimate how much municipalities could save (via damage/cost avoidance) by upgrading undersized infrastructure. The towns and residents could benefit significantly from this analysis.

Additionally, stormwater runoff has been recognized in all areas of the country as having a major impact on water quality. Locally, the Sunapee Area Watershed Coalition (SAWC), listed

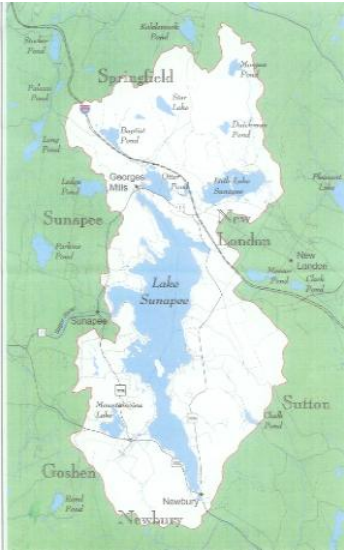
the reduction of stormwater impacts as its first water quality priority, and the Lake Sunapee Protective Association has been working for years to reduce these impacts to all water resources. We are fortunate to have this project taking place in our watershed.

- June Fichter & Robert Wood, LSPA



June Fichter & Robert Wood at the 10/28 SWIP Stakeholder forum

A Note from the Principal Investigators



Lake Sunapee Watershed

We are excited to be partnering with you in this project. Your community's exceptional diligence in managing water-related issues ensures that our findings will inform effective decisions into the future. And, due to the ongoing pattern of extreme storms, community leaders need specific and up-to-date information to effectively plan for your protection. Your community's decision to host this study is shared by stakeholders in, and outside, the region, as evidenced by support from the United States Department of the Interior, the New Hampshire Department of Environmental Services, the Granite State Rural Water Association, the New Hampshire Association of Natural Resource Scientists, and the Upper Valley Lake Sunapee Regional Planning Commission.

The project will help you

effectively plan community response so to mitigate increased run-off from the surrounding watershed. Associated with this project, educational and discussion events will promote understanding of ongoing risks, and help facilitate community-wide support for protective actions.

The project researchers will develop a number of products that can help inform future planning decisions at the community and regional level. These will include:

- The response of the Lake Sunapee watershed and drainage system to increased run-off;
- Projected rainfall from recent and expected extreme storms;
- The potential for change in land use regulations and zoning to mitigate future impacts from increased run-off;
- Planning-scale estimates of the costs for maintaining current water

conveyance infrastructure capacity versus costs of upgrading such systems to avoid future damage to road infrastructure.

Your community is unique in many ways, and we look forward to working with you over the course of this project.

- Michael Simpson, Antioch University New England

- Latham Stack, Syntectic International LLC



From left to right: Michael Simpson, Latham Stack, and Jim Gruber facilitating the first public SWIP meeting

“Good time! Look forward to outcome and helping out with task.”

-SWIP Participant



View of Lake Sunapee

The Field Work So Far...

Utilizing both local area residents as volunteers, combined with a number of graduate students from Antioch University New England, the Lake Sunapee Infrastructure Project started its field work in the fall of 2009 with the intention to assess the condition of over 180 culverts and bridges, as well as the landscape surrounding them within the Lake Sunapee watershed boundaries. The assessment team was created and carefully trained to be able to perform the assessment without missing any important detail for each site.

Project investigators developed a four page

descriptive survey sheet that was used by the assessment team in order to take measurements required to determine the current design capacity of existing culverts and bridges. The survey included such important features as culvert/bridge shape, size, and material, orientation of culvert to natural stream channels, various stream bank measurements, road type and material, and any possible challenges current infrastructure may cause to wildlife. Each culvert or bridge has been photographed from both inlet and outlet sides and given an ID number for future analysis.

The whole assessment part of the field work ended in November 2009

after research staff checked the collected data for quality control, and if necessary revisited sites that required additional data collection. At this point, field data had been entered into the database and sent to the project experts for analysis. Analysis will eventually show which culverts or bridges have a high risk of failure during a storm event. This represents the beginning of the analysis. Residents will be updated on progress at the May 2010 meeting.



Antioch New England Graduate Students help to gather field data

The Results So Far...

In a recent interview with one of the principle investigators for the project, Michael Simpson from Antioch University New England provided an overview of what has been accomplished to date on the Sunapee Watershed Infrastructure Project and what the next steps will be.

As Simpson stated, the field work has been completed and the information has been entered into a database. These included descriptions, measurements and photographs for all culvert and bridge stream-road crossings in the watershed. He indicated

that this database has been sent to researchers on the west coast, where they will determine the maximum stream flow that these crossings can handle.

This information will be used in conjunction with an analysis of the Sunapee watershed natural and built landscape, combined with soils information, to determine what amount of storm run-off can be expected from various amounts of rainfall. Simpson states that ultimately this will allow the research team to project which culverts will be under capacity for a

specific size storm.

Other scientists on the project are currently looking at historic changes in rainfall amounts over the last 30 years in comparison with the rainfall data from the last century to understand to what degree there has been an increase in larger storm events. "We are basically looking to see what the potential of the culverts will be to handle the increase in storm run-off flowing down the watershed due to the trends seen in precipitation in New England," explained Simpson.

WHAT'S NEXT?

"We need to project possible changes in land cover due to the population growth in the watershed as a result of new construction of houses. More construction means more impervious surfaces, which can increase the amount of run-off flowing into streams." Simpson pointed out that landcover information will be used to project into the future the ability of culverts and bridges to handle the run-off not only from increased precipitation but also from increased impervious surfaces in the watershed. Finally, project experts will be looking at the cost to enlarge undersized culverts to meet future projections in population change combined with change in rainfall amounts.

The project team is committed to keep citizens informed of any findings in the near future and would appreciate input during the May 2010 meeting.



Who knew field work could be so fun!

10/28 Stakeholder Forum Highlights



Jim Gruber of Antioch University reviews the master list

The first stakeholder meeting for the Lake Sunapee Watershed Infrastructure Project (SWIP) took place on October 28th, 2009. Approximately forty stakeholders from different towns within the watershed, as well as nonprofit organizations, local businesses, and state agencies attended this initial meeting. Participants were encouraged to mix and mingle to help promote the flow of knowledge and ideas. An overview of SWIP was given by the project team that focused on the need for this type of work in the Lake Sunapee region.

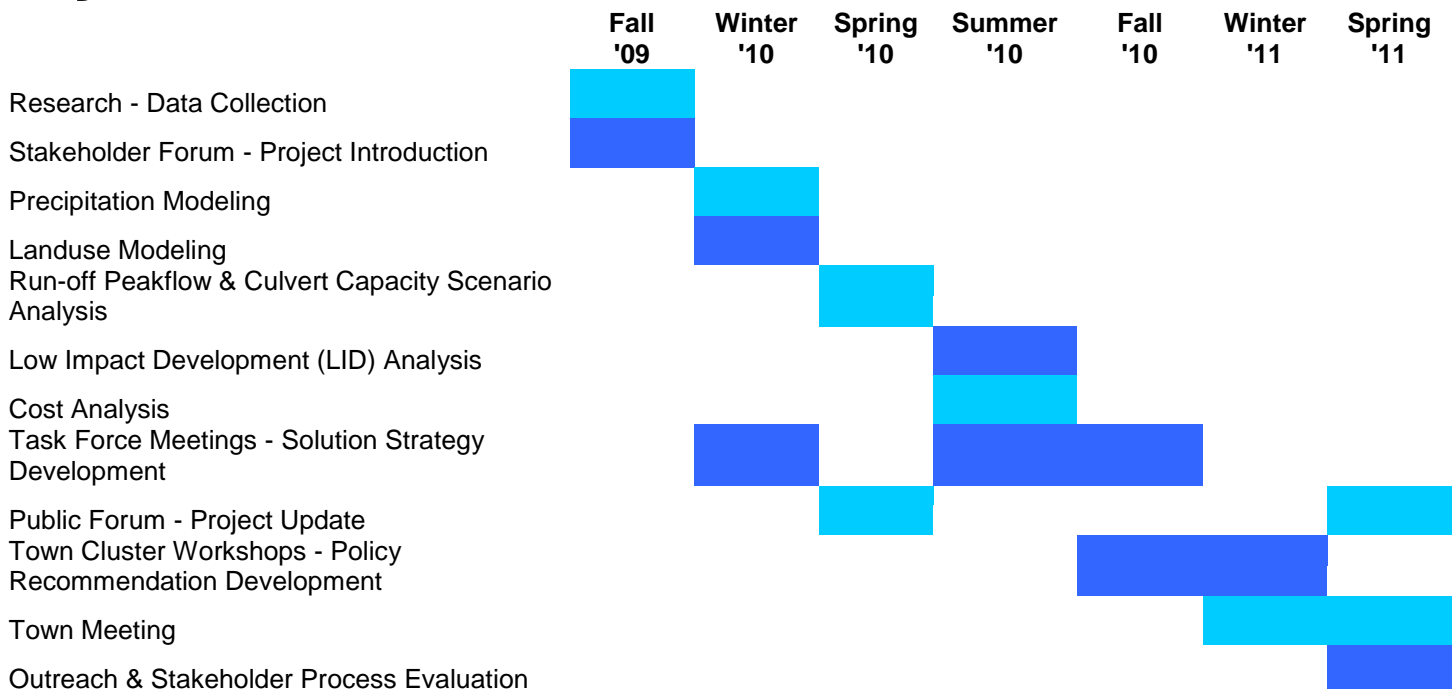
Afterwards, participants dove right into work. Participants identified the problems and current challenges facing the Lake Sunapee watershed's current infrastructure. All ideas were shared with the larger group, creating a master list. Attendees were asked to prioritize the master list to identify the main problems of current infrastructure.

"This project is a wonderful follow-up to the Sunapee Watershed Management Plan."
 - Robert Wood, LSPA



Participants prioritize issues with stickers

Project Timeline



Five major priorities were recognized and grouped into three areas to then expand into task forces. Each task force will have two meetings. The initial meetings are listed below. The follow-up meetings will be held in the summer or fall of 2010. Interested parties are encouraged to participate in at least one of the three task forces described below. Participation is vital to the success of this project.

Development and Zoning

This task force will focus on how to develop while maintaining natural water systems.

First Meeting: February 17

Reducing Impact: Water Retention and Impervious Surfaces

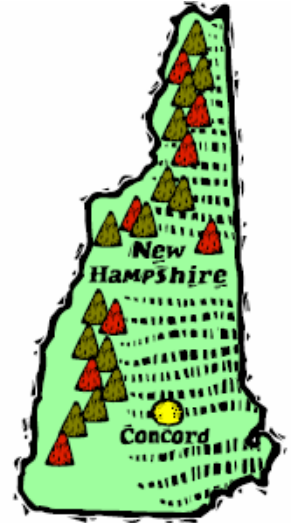
This task force will focus on: how to address the increase in intensity of storms and how to address the increase in impervious surface.

First Meeting: March 31

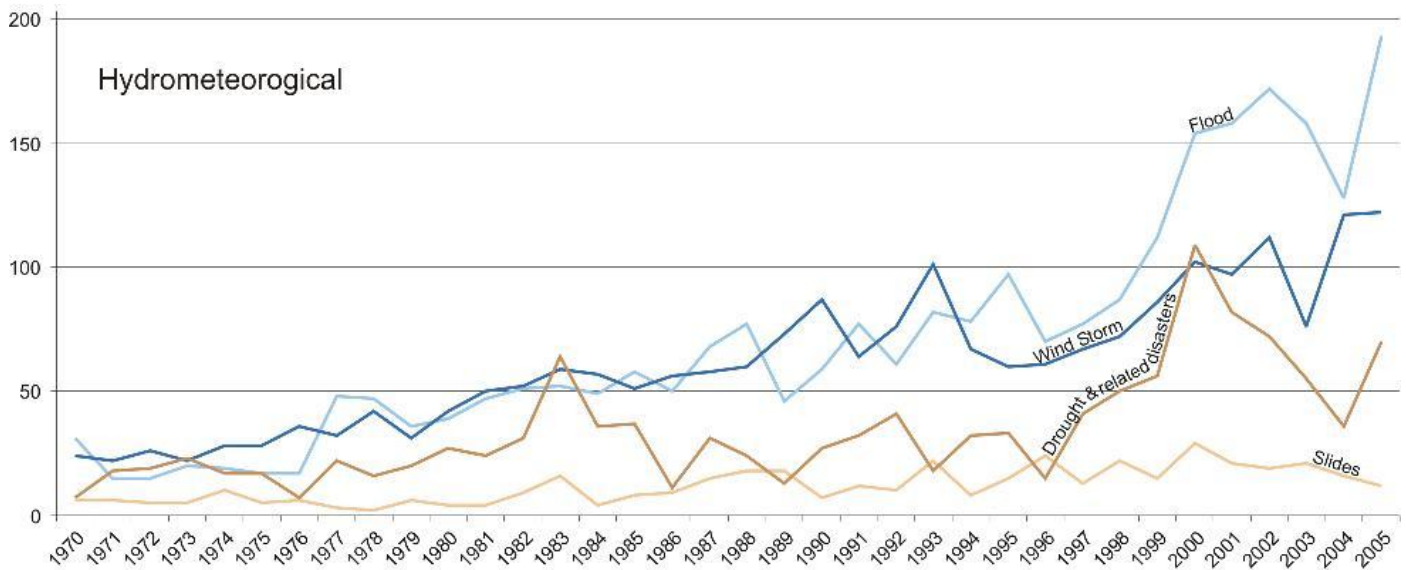
Local Government and Infrastructure

This task force will focus on: how to address undersized culverts and what to do about aging infrastructure.

First Meeting: April 21



The Number of Natural Disasters World-Wide - 1970 to 2005



Source: International Strategy for Disaster Reduction

The Importance of Infrastructure



Culvert showing corrosion from stormwater

Have you ever been driving down the road, on your way home, only to find that the road has been washed out from the recent storm? Then you know exactly the importance of well functioning stormwater infrastructure.

The term 'infrastructure' can be confusing since it references many things. Generally, infrastructure refers to the physical or organizational structures that allow for the smooth operation of a society. Some examples include electrical power grids, transportation and communication systems, water supplies and sewer systems, even hospitals and schools.

One form of infrastructure that everyone is very familiar with is the road network, on which stormwater infrastructure can have a great impact. Stormwater infrastructure is meant to manage stormwater within a community, typically through retention basins, storm drains, and culverts, which allow the land to be utilized for roads and other developments. However, when these systems fail or cannot keep up with precipitation, flooding and road or bridge washouts often occur. The floods of 2005 and 2007 in this region are good examples of this problem.

The Lake Sunapee Watershed Infrastructure Project is currently focused on culverts and the role they play in rising flood-damage expenses. A culvert is a means of enclosing flowing water so that it may flow underneath a road, railroad track, path, or embankment. Culverts can be composed of many types of materials, including concrete, steel, or plastic and can be many shapes such as round, oval, or square. Ideally, a culvert will be large enough to allow for flowing water to run freely

through it at both normal water levels as well as at higher levels from precipitation or snowmelt. However, when a culvert is not large enough or has become impaired in some way, the culvert begins to act as a dam, allowing water to build up force behind it until ultimately washing out everything in its path.

There are multiple options in resolving this issue. The first is to simply install larger culverts that can adequately handle peak flow during a large storm event. Another alternative is to decrease the amount of water that runs off the landscape. One approach to this second option is Low Impact Development (LID), with a goal to design hydrologically functional sites that mimics predevelopment conditions by encouraging more infiltration, filtration, evaporation, and storage of water. LID addresses stormwater through a variety of small, cost-

effective landscape features located on-site and benefits communities by dispersing, rather than concentrating, large amounts of stormwater run-off.

In the coming year, the Lake Sunapee Watershed Infrastructure Project will conduct research throughout the region and provide local municipalities with information to guide decision-makers. It is essential for community members to be involved as this project moves forward in order to utilize this information and make appropriate recommendations regarding stormwater infrastructure, future development projects, and updates to town management plans. Working together, stakeholders and the project team can reduce risk from changing storm and land use conditions while also realizing actual cost savings.



Washed out road in SW New Hampshire, October 2005

Some Key Terms

Watershed – An area of land in which all of the water that drains from it goes to the same place (lake, river, etc). Watersheds come in all shapes and sizes. They cross county, state, and national boundaries. The Lake Sunapee Watershed, for example, crosses boundaries of six towns around Lake Sunapee.

Surface Run-Off – Water from rain, snowmelt, or other source that flows over the land surface. Run-off is a major transporter of non-point source pollutants.

Peak Flow – A maximum water level reached from a precipitation event. Peak flow may occur after the precipitation event has ended.

"Facing these dangers we have only three options. We're doing some mitigation, we're doing some adaptation, we're doing some suffering. And minimizing the amount of suffering in that mix can only be achieved by doing a lot of mitigation *and* a lot of adaptation."

- John P. Holdren, Meeting the Climate-Change Challenge, John H. Chafee Memorial Lecture on Science and the Environment

A Rundown of the Project Team

Latham Stack, Syntectic International LLC

Stack is the Principal Investigator overseeing all project activities including data collection, analyses, and data sharing with stakeholders.

Michael Simpson, Antioch University New England

Simpson is the Co-lead Investigator working with Stack on project management, study measures, data collection and data sharing with stakeholders. Simpson will conduct adaptation cost analyses as well as develop project reports.

Robert Roseen, University of New Hampshire

Roseen is the Co-lead Investigator working from the UNH Stormwater Center to provide low impact development scenarios to be used in analysis.

Joel Smith, Stratus Consulting Inc.

Smith will advise on coupled-climate model output and adaptation policy. Smith will also participate in stakeholder education activities.

James Gruber, Antioch University New England

Gruber will serve as the project engineer in charge of community education, outreach and participatory decision-making.

Thomas Crosslin, Climate Techniques

Crosslin will serve as the project engineer in charge of rainfall-runoff modeling, drainage system reverse-engineering, and dam vulnerability. He will also provide expertise in Geographic Information Systems (GIS), which will be needed for the project analysis.

Robert Wood, Lake Sunapee Protective Association

Wood will provide day-to-day oversight to all community outreach efforts and will also oversee the daily field work associated with determination of study measures.

Graduate students, Antioch University New England

Seven work study student will be recruited from Antioch University New England. Four will assist with field work and three will assist with educational outreach.



**Lake Sunapee
Protective
Association**

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For more SWIP
information visit the
LSPA Website:
<http://lakesunapee.org>

Upcoming Events

February 17, 2010

Development and Zoning Task Force Meeting
6³⁰-8pm
LSPA offices

March 31, 2010

Reducing Impact: Water Retention and Impervious Surfaces Task
Force Meeting
6³⁰-8pm
LSPA offices

April 21, 2010

Local Government and Infrastructure Task Force Meeting
6³⁰-8pm
LSPA offices

May 12, 2010

Task Force Update Meeting
Time & Location TBA

May 13, 2010

Guest Speaker
Time & Location TBA

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