VERMONT
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INTRODUCTION

The VGS, a Division in the Department of Environmental Conservation (DEC) in the Agency of Natural Resources, is guided by the Department mission to protect human health and safety. We provide, through service, research, publications and educational outreach, high quality, objective geologic information integral to the health, safety and well-being of Vermonters. Activities are guided by statute that designates the State Geologist as the Director of the Division of Geology and Mineral Resources. Statutory activities include:

- Conduct surveys and research related to the geology and mineral resources of the State.
- Give aid and advice relating to the development and working of rock and mineral deposits suitable for building, road making and economic purposes.
- Provide information and education to government, industry, other institutions and organizations and to citizens regarding geology, mineral resources and topography of the State.
- Provide technical information and advice regarding the management of mineral resources on state-owned lands, and cooperate where possible by providing geologic expertise and advice to persons conducting regulatory programs for the State.
- Provide geological services to the Natural Gas and Oil Resources Board.
- Maintain records of old and new information relating to the geology, mineral resources and topography of the State.
- Prepare and publish reports on the geology, mineral resources and topography of the State.

Since the completion of the 2011 Bedrock Geologic Map of Vermont, the VGS has focused on geologic mapping, geologic hazards, groundwater quality and quantity, and the geologic basis of certain health concerns. Groundwater in fractured bedrock, radioactivity and arsenic issues, landslide hazard mapping and monitoring, and geochemical landscape are topics of current studies conducted with our university and sister agency partners.

The newly-formed Science Advisory Committee for the Agency of Natural Resources is co-chaired by the State Geologist and includes members from all three departments: Fish and Wildlife, Forest, Parks and Recreation, and Environmental Conservation. The committee charge is to strengthen science, monitoring and data functions in the Agency and to support the Agency need to integrate science with policy and decision making.

In terms of operations, the DEC implemented a process of results-based accountability (RBA) and performance measures which measure our positive impacts and products developed for the State. As a group of two geologists, plus one funded position at Norwich University, our challenge is to maintain and build capacity to do valuable geologic work for Vermont. We accomplish our work through federal funds and partnerships with towns, universities and other organizations who provide the necessary in-kind match.

GEOLeGIC MAPPING

Bedrock and surficial maps are used to address such issues as radioactivity and arsenic in groundwater, groundwater recharge potential and to mitigate landslide hazards. The VGS involves communities at a grassroots level and addresses issues specific to town and state needs while maintaining the quadrangle mapping structure. This year our town partners provided in-kind match (GIS services and field assistance) for STATEMAP, a valuable cooperative mapping program for the Survey. The funds were further leveraged through student interns who spent time in the field and later completed projects ranging from water chemistry to tectonics. Maps are posted on the VGS web site for easy access for Vermont communities.

The following maps and Open File reports, funded in part by the STATEMAP program, were released in 2015:


GROUNDWATER AND HEALTH

In 2015, the VGS and our Norwich University partner completed bedrock and surficial geologic maps of the Woodbury Quadrangle. These maps provided the geologic framework for assessment of the groundwater resources and geochemistry which will completed in the coming months. Groundwater resource maps were also completed for Bristol and included wells and borings, depth to bedrock, hydrogeological
the Local Hazard Mitigation Grant Program (LHMP) was initiated
A landslide hazard mapping project in Highgate, funded through
field verification is funded through EMPG.
addison county following protocols which use LiDAR with some
mapping protocols. A Phase One landslide hazard map for
regional planning commissions and implementation of landslide
monitoring of landslide and rockfall sites were major activities
of the hazard program. Outreach efforts were directed towards
VGS. Landslide hazard mapping, first response to landslides, and
Landslide hazard mapping is a performance measure for the
hazards
for evaluating sustainable water use in Vermont.
for groundwater characterization and collect baseline data useful
availability, quality, compatibility and delivery of water-use data.
Commissions requested our assistance in defining areas at higher
and hydrogeological information. Vermont's Regional Planning
identification of geographic areas in need of detailed groundwater
use data to apply towards water budget analyses and towards
state of water withdrawal and consumptive use data collected in
Vermont and to investigate, based on priorities, how to develop
collection efforts to produce at least Tier 1 baseline data. The
VGS seeks better quality water withdrawal and consumptive use
data to apply towards water budget analyses and towards
identification of geographic areas in need of detailed groundwater
and hydrogeological information. Vermont's Regional Planning
Commissions requested our assistance in defining areas at higher
risk during drought and in understanding groundwater availability.
The long-term (multi-year) grant objective is to improve
availability, quality, compatibility and delivery of water-use data.
This addresses one of our strategies to build framework data sets
for groundwater characterization and collect baseline data useful
for evaluating sustainable water use in Vermont.

Hazards

Landslide hazard mapping is a performance measure for the
VGS. Landslide hazard mapping, first response to landslides, and
monitoring of landslide and rockfall sites were major activities
of the hazard program. Outreach efforts were directed towards
regional planning commissions and implementation of landslide
mapping protocols. A Phase One landslide hazard map for
Addison County following protocols which use LiDAR with some
field verification is funded through EMPG.

A landslide hazard mapping project in Highgate, funded through
the Local Hazard Mitigation Grant Program (LHMPG) was initiated
in 2015. The mapping is part of a phased project in which hazards
are mapped and at-risk areas are identified. The findings of
the hazard assessment report will be used to identify potential
mitigation projects and will be incorporated in the Town's Local
Hazard Mitigation Plan (LMHP). The goal of the project is to reduce
public exposure to these physical hazards.

The Northeast States Emergency Consortium (NESEC) and the
VGS are working to develop technical information applicable to
earthquake mitigation in Vermont. The work is focused on an
evaluation of critical facilities using ROVER (Rapid Observation of
Vulnerability and Estimation of Risk) and the potential response
to seismic events. NESEC determined that a cost and labor
effective alternative to building site visits was to use the map and
street views in Google Earth to obtain baseline data. This was a
significant time-saver and required only a brief meeting with the
National Guard to verify the data. The project is on schedule for
completion in February 2016.

Other activities included groundwater mapping projects and
drought, seismic hazard mitigation and outreach to critical
families managers in northwest Vermont, and several public
presentations.

Education, Outreach, and Presentations

Survey staff is active in education and outreach through school
visits, field trips for towns and local officials, lectures, and the web
site. Presentations at professional meetings such as the National
Groundwater Association and the Northeast Geological Society
of America are important venues for maintaining our geologic
expertise and contributing to the science community. We also
gave numerous presentations to other government agencies and
non-profit organizarions.

The web site was completely re-designed and will go live in early
2016.

Milestones

On March 13, 2015 the House and Senate adopted S.C.R. 10
honoring the work and contributions of Laurence R. Becker as

The crest of the Green Mountain Anticlinorium, looking north from
Camels Hump to Mt. Mansfield.