

**TO:** Education, Personnel and Student Life Committee

Aly Richards, Chair  
Jim Masland, Vice-Chair  
Shavonna Bent  
Janette Bombardier  
Lynn Dickinson  
Karen Luneau

**FROM:** Yasmine Ziesler, Chief Academic Officer



**RE:** EPSL Meeting on December 1, 2017

**DATE:** November 21, 2017

The EPSL Committee of the VSC Board of Trustees will meet on Friday, December 1st at 9:30 a.m. in Campus Center at Castleton University. Materials for the meeting are attached.

I can be reached at (802) 224-3025 if you have any questions.

Thank you.

cc: VSC Board of Trustees  
Council of Presidents  
Academic Deans  
Student Affairs Council

**Vermont State Colleges Board of Trustees  
Education, Personnel, and Student Life Committee Meeting**

**December 1, 2017**

**AGENDA**

1. Call to order
2. Approval of the August 23, 2017 minutes
3. Vermont Tech: Policy 102 New Program Proposal for A.A.S. in Forestry
4. Policy 101 “PreCIP” 2017 Reports and 2018 Reviews
5. Information Item: Affordable Care Act provisions and Proposed Revision to Policy 202
6. Follow up to Long-Range Planning Committee discussion of “automatic associate degree award” concept
7. “Start to Finish” initiative update
8. Other business
9. Comments from the public

**MATERIALS**

1. August 23, 2017 minutes
2. Vermont Tech Policy 102 New Program Proposal for A.A.S. in Forestry
3. Policy 101 “PreCIP”
  - a. Council of Presidents Recommendations for 2017
  - b. Review Committee Reports
  - c. Resolution: Commendation of Committees on 2017 Process
  - d. Approval of Programs and Process for 2018 Review
4. Policy 202
5. Data: Student Credit Progress in the VSC
6. “Start to Finish” Strategy Planning Draft

**Item 1:**  
**Approval of August 23, 2017 Minutes**

## **UNAPPROVED minutes of the VSC Board of Trustees Education, Personnel, and Student Life Committee meeting Tuesday, August 23, 2017**

*Note: These are unapproved minutes, subject to amendment and/or approval at the subsequent meeting.*

The VSC Board of Trustees Education, Personnel, and Student Life Committee met on Wednesday August 23, 2017 at the Office of the Chancellor, Montpelier, VT.

Committee Members present: Aly Richard (Chair), Jim Masland (via phone for part of the meeting), Shavonna Bent, Karen Luneau, Janette Bombardier

Absent: Lynn Dickinson

Presidents: Elaine Collins, Joyce Judy, Pat Moulton, Dave Wolk

Other Trustees: Jerry Diamond, Tim Jerman, Church Hindes, Mike Pieciak

From the Chancellor's Office:           Jeb Spaulding, Chancellor  
  Sophie Zdatny, General Counsel  
  Yasmine Ziesler, Chief Academic Officer  
  Tricia Coates, Director of External & Governmental Affairs  
  Steve Wisloski, Chief Financial Officer  
  Harriet Johnson, Executive Assistant

From the colleges:

Beth Walsh, President, VSCUP  
Nolan Atkins, Provost NVU, Johnson and Lyndon State College  
Jonathan Davis, Dean of Students, Lyndon State College

### 1. Call to Order

Chair Aly Richards called the meeting to order at 1:08 p.m. Formal introductions for 2 new Board Trustee members, Janette Bombardier and Shavonna Bent were made.

### 2. Consent Agenda

- a. Approval of March 24, 2017 Meeting Minutes

The minutes were approved unanimously.

b. Approval of June 20, 2017 Information Session Meeting Minutes

The minutes were approved unanimously.

3. Review of EPSL Areas of Responsibility

Chair Richards reviewed the Areas of Responsibility for the EPSL Committee and went over the list outlining the duties which include requirements on an annual basis and requirements needed on an ongoing basis.

4. EPSL Planning for 2017-2018

Chair Richards asked the Committee to review the EPSL Meeting and Planning & History table then proceeded on to the list of Potential EPSL Focus Topics and Questions. She reviewed the list and asked the Committee to think of any strategic questions they might have for the Board on these items.

Chancellor Spaulding asked the Presidents what process they use to determine if a new program should be started. President Wolk stated they listen to student requests, faculty interest and the collective work of admissions. President Moulton added they also get requests from the industry. President Judy added the Vermont job market is also an important factor. President Collins followed up by saying, along with VTC, they too have a relationship with EAB. They rely on data to make determinations, including state data and trends. Chair Richards commented on the importance of sharing best practices.

President Moulton stated VTC has established a new program development process to take a broader review looking at the components of establishing a new program. Part of the program review process includes a marketing budget to help launch a new program. Chair Richards says it would be an opportunity for the EPSL Committee to look at the new process VTC has established to have a better understanding of it.

Trustee Bombardier asked where the high school connection is in the list. Chair Richards acknowledged this is an important topic to be added in addition to partnerships with K-12. President Moulton would also like student experience added to the list and President Judy asks that the committee keep the Presidents up to date on the tobacco free movement.

Chair Richards will continue to add items and priorities to the list for the next meeting.

5. Discussion of VSCS Retention & Graduation Project

Chancellor Spaulding handed out the list of six priorities. He briefly reviewed each one and their importance with emphasis on the 2<sup>nd</sup> priority: Improve the retention and graduation rate at our colleges. He is seeking the board support for a system initiative to improve retention and graduation.

Yasmine Zeisler, VSC Chief Academic Officer, discussed the draft proposal which the Chancellor and Board are initiating aligning and advancing efforts to increase student retention and persistence, emphasizing the importance of monitoring progress and supporting student's success.

Chancellor Spaulding suggested more details about the initiative would be helpful before the September Board meeting. The committee discussed different options of student credits and how to best help the students achieve graduation and plan for their future.

Chancellor Spaulding requested a resolution be drafted for supporting the initiative of the retention and graduation project for consideration at the September board meeting.

6. Policy 102: New Program Proposal for A.S. in Criminal Justice, Lyndon State College

At this time, the Committee did not have a quorum.

Chair Richards and Chancellor Spaulding agreed to continue on discussing the proposal.

Johnson State College President Elaine Collins shared support for this program and said it would help retain students who are thinking of leaving Lyndon to pursue Criminal Justice at another institution.

Provost Atkins also supported the policy indicating it is an excellent exit strategy allowing students to achieve an A.S. and leave with a credential. Trustee Hinds asks if the colleges should have more A.S. degrees, and consider students receiving A.S. after 2 years if the student does not want to stay on at that time. Provost Atkins said Lyndon State College had previously discussed awarding everyone who passed 2 years with an Associates of Liberal Studies.

Chair Richards stated she will report to the Board that, although there was no quorum at the committee level, all those present support the proposal and request Board approval.

7. Other Business

None

8. Public Comment

Beth Walsh, President of VSCUP shared a success story of a student receiving their A.S. degree.

9. The meeting adjourned at 2:32

Item 2:  
Vermont Tech Policy 102 New Program Proposal for  
A.A.S. in Forestry

To: VSC EPSL Committee  
From: Kim Crowe, Ag Dept Chair and Molly Willard, Ag Inst Manager  
Date: 11/21/2017  
Re: A.A.S. In Forestry & 2 plus 2 with UVM

# FORESTRY A.A.S.

The Forestry Associates of Applied Science is a proposed program that will offer an additional opportunity for students within the Agriculture Department. This program is in direct response to the following:

1. Vermont State Act 166, effective July 2016, mandates that foresters within the State of Vermont must obtain an Associate's or Bachelor's Degree from an accredited program, in addition to work experience, in order become licensed within the state.
2. High numbers of inquiries and visits to Vermont Technical College in search of Forestry course options.
3. Direct feedback from High School Career Technical Centers for the promotion of an educational pathway within the State of Vermont for their field of study. Currently, the majority of their students attend college out of state.

## FINANCIAL STRATEGY

1. Attached (pg. 47) is a budget that includes a breakeven student total of 5 students for the program. This budget includes a financial investment of \$93,000 in capitalized, which is additional but not necessary for the program.
2. All of the courses intended for the Forestry A.A.S. are pre-existing.
3. We currently have the following requested grants out for review, but not required for the program, but would help with program expansion.
  - a. NIFA Capacity Building Grant (\$299,573.50)
  - b. Working Lands Grant (\$75,000)
  - c. WETF (Workforce Education Training Funds) (\$75,000.00)



## ENROLLMENT

1. We anticipate that the goals of enrollment will be met quickly. Please refer to the data outlining the number of Forestry and Natural Resource students that are currently enrolled in the state high school Technical Career Centers (page 49). Additionally, we have recent emails (attached) that indicate that the majority of students from these programs are leaving the State of Vermont to attend Paul Smith College in New York. Our tuition will be more favorable instate than that of Paul Smith College.
2. We anticipate meeting the break even number of students within two years.
3. We anticipate that we will exceed our break even enrollment within three years based on the information that has been obtained from email and phone interviews with Technical Career Center directors.
4. Currently UVM only has two of their 50 enrolled Forestry students that matriculate from within the State of Vermont, we feel that there is a large audience of in-state students that can be captured with the offering of this program.

## INDUSTRY DEMAND

1. With Act 166, the State of Vermont is attempting to regulate the Forestry Industry to ensure that people within this career field are qualified to maintain a sustainable forest and industry for the extended future. In the foreseeable future, the demand for this program will be high.
2. As evidenced by meetings with Mike Snyder and Sam Lincoln, from the Agency of Forests, Parks and Recreation, they are willing to help create a program that will satisfy this niche. Attached is an email expressing their dedication to the program development and a list of names for a working advisory board.
3. The program has strengths in both forestry and logging, depending on the direction the individual student would like to pursue.
4. With the +2 option developed with UVM, we feel that additional seats within their program will likely be filled subsequent to receiving an Associate's degree from VTC. This bodes well for the State of Vermont.

## VSC MISSION

1. The proposed Forestry Associate of Applied Science degree complies with the mission of the VSC and also Vermont Tech.
2. Additionally, the Forestry A.A.S. meets the goals of the program offerings within the Department of Agriculture. Diversified Agriculture Bachelor students, as well as Agribusiness Management students, also have access to the core Forestry courses. Several of these students have filled seats within these courses.
3. The courses are in-line with the current strength of Vermont Tech, in that the courses are dependent on the 'hands-on' approach that our students have come to expect. This provides students that are capable of garnering employment opportunities immediately post graduation.
4. The A through R General Education Assessments have been considered in the development of the proposed program.
5. All but one course currently exists in approved format. Dendrology has been developed and is currently offered as a special topics course. We anticipate that this course will be approved, once the program is approved.



## Willard, Molly E.

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**From:** Lincoln, Sam <Sam.Lincoln@vermont.gov>  
**Sent:** Monday, October 30, 2017 4:10 PM  
**To:** Moulton, Patricia L.  
**Cc:** Snyder, Michael; Willard, Molly E.  
**Subject:** Vermont Tech forestry

Hello Pat,

Thank you for taking the time to meet with us last week. It was great to finally sit down and visit about the forestry program. Per Molly's excellent suggestion of a groundworks event to further develop what a Vermont Tech forestry graduate should be exposed to, I am including a list of people and businesses involved in the forest economy that would be important to have at the table for a strategy session. In order to not exclude anyone we may have overlooked, we suggest that an invitation include a prompt for these folks to forward it to colleagues that they feel are important to have at the table. In particular, there could be many more foresters and logging contractors on the list. There will likely be a percentage of invitees that cannot attend so casting a wide net upfront should yield a large enough group for a thorough discussion.

Should you choose to move this event forward, I am available to assist with further planning and drafting or reviewing the invitation that goes out, utilizing my industry (and Vermont Tech) background to ensure that the language and goals are understood and attractive to those who receive it. Many on this list are self employed and action oriented so I'd propose a half day meeting with a well planned and executed agenda. If there are other ways that we can help to advance this effort, please let us know.

Best,  
Sam

### Sawmills/purchasers of forest products

- Cersosimo
- Allard Lumber
- A. Johnson
- Britton Lumber
- Burlington Electric, forestry and someone from the boiler plant
- Ryegate Power Station, forestry and someone from the boiler plant
- Mill River Lumber
- Lamell Lumber Corp.
- Gagnon Lumber
- International Paper
- Finch Paper
- Ames True Temper
- Durgin & Crowell Lumber Co.
- Columbia Forest Products
- Ethan Allen
- NELMA representative if there isn't one on this list

### Foresters

- Markus Bradley
- Ben Machin

- David Birdsall (wearing the LEAP hat too)
- Robbo Holleran
- Tony Lamberton
- Jeremy Turner
- Dan Kilborn
- Ryan Kilborn
- Jonathan Wood
- Kathy Beland
- Rich Carbonetti

#### Logging/Trucking Contractors

- Steve Galbreath
- Gabe Frietag
- Lathrop Forest Products
- Longview Forestry, Jack Bell and Jim Hourdequin
- Jim Cloud
- David Goodhouse
- Hanson Savage
- Raymond Duquette
- Gabe Russo
- Everett Thurston

#### Forestry Equipment Dealers in Vermont

- Nortrax (John Deere)
- Milton Cat
- Anderson Equipment
- Pete's Equipment

#### Arborists

- VJ Comai
- John Farr
- Warren Spinner

#### Landowners

- Put Blodgett (or other) Vermont Woodlands Association
- Mark Doty and/or Chris Fife, Weyerhaeuser
- Steve Webster, L.W. Webster Co.

#### Educators

- Tony D'Amato
- Ross Morgan
- Jim Esdon
- High School Tech Center Representatives

#### Government

- FPR – Mike Snyder, Steve Sinclair, Keith Thompson, Paul Frederick, Danielle Fitzko, Dave Wilcox, Sam Lincoln



**Sam Lincoln, Deputy Commissioner**  
**Department of Forests, Parks & Recreation**

One National Life Drive, Davis 2

Montpelier, VT 05620-3801

[Phone] 802-622-4005 [Email] [sam.lincoln@vermont.gov](mailto:sam.lincoln@vermont.gov)

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<http://www.vermont.org/>



## Willard, Molly E.

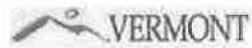
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**From:** Lincoln, Sam <Sam.Lincoln@vermont.gov>  
**Sent:** Wednesday, November 15, 2017 1:53 PM  
**To:** Willard, Molly E.; Moulton, Patricia L.  
**Cc:** Snyder, Michael; Crowe, Kimberly A.  
**Subject:** RE: Vermont Tech forestry

Hi Molly,

A quick update. I attended two UVM logger business trainings last week and also was on a woods walk with Tony D'Amato and there were brief discussions about a forestry program at VTC. There was strong interest in supporting this concept. Tom Ostler (from Hartford) and Ben Notterman (from Hardwick), both tech center natural resource program leaders, were at one of the trainings and Tom mentioned that he sends five students on average to Paul Smith's forestry program annually. Tom and Ben would be beneficial additions to your strategy session.

Best,  
Sam



**Sam Lincoln**, *Deputy Commissioner*  
**Department of Forests, Parks & Recreation**  
One National Life Drive, Davis 2  
Montpelier, VT 05620-3801  
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**From:** Willard, Molly E. [mailto:[MWillard2@vtc.vsc.edu](mailto:MWillard2@vtc.vsc.edu)]  
**Sent:** Tuesday, October 31, 2017 11:52 AM  
**To:** Lincoln, Sam <Sam.Lincoln@vermont.gov>; Moulton, Patricia L. <patricia.moulton@vtc.vsc.edu>  
**Cc:** Snyder, Michael <Michael.Snyder@vermont.gov>; Crowe, Kimberly A. <KCrowe@vtc.vsc.edu>  
**Subject:** RE: Vermont Tech forestry

Hi Sam,

This is great.

Thanks for taking the time to meet with us, support the effort and compile this list.

My next step will be to draft an invitation that I will then send to you for editing. If we have additional people to add I will do so at the time I send you the invite letter.

I will be in touch soon.

Thanks  
Molly

**Molly E Willard** | Project Manager of The Institute for Applied Agriculture and Food Systems, CEWD  
**VERMONT TECH**

802.535.5315 | [mwillard2@vtc.edu](mailto:mwillard2@vtc.edu)



Admin 128  
PO Box 500 | Randolph Center, VT 05061

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**Cc:** Snyder, Michael <[Michael.Snyder@vermont.gov](mailto:Michael.Snyder@vermont.gov)>; Willard, Molly E. <[MWillard2@vtc.vsc.edu](mailto:MWillard2@vtc.vsc.edu)>  
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**VERMONT STATE COLLEGES  
POLICY 102 NEW PROGRAM PROPOSAL TEMPLATE**

**Part I: General Information**

1. *Institution:* Vermont Tech; Agriculture Department
2. *Name of new program:* Forestry Associates with a 2 + 2 option at UVM
  - a) *Individual(s) with responsibility for program development:* Molly Willard, Kim Crowe
  - b) *Academic Department(s):* Ag Department, AGR
3. *Proposed start date of program:* Fall 2018
4. *Title of degree to be conferred (if applicable):* Associate of Applied Science in Forestry
5. *Brief description of proposed program (150 words or less):*

The program will expand upon the existing forestry certificate program, which has lost validity in the workforce based on legislation that was passed in July 2016. The proposed program allows students to pursue an Associate's degree. Continuation at UVM in the Department of Natural Resources or B.S. in Diversified Agriculture at Vermont Tech are continuing options for Associate degree graduates.

## **Part II: Rationale**

- 1. How the program will strengthen the institution (refer to institutional mission, institutional priorities and existing institutional programs) and how the perceived interest in the program at the institution was determined:*

By offering an Associates in Forestry, an educational pathway is created for CTE students enrolled in natural resource management programs, increase partnerships with Vermont employers, increase post-secondary education, and increase training in Vermont high school students and women in STEM. The project aligns with Vermont Tech's Gen-Ed requirements A-R.

**Aligns with VSC Goals:** The program aligns with the following VSC goals:

- Furthering competence in communication, research and critical thinking
- Fostering creative problem-solving both individually and collaboratively
- Create engaged, effective and responsible citizens,
- Develops in others the joy and necessity of lifelong learning
- Develop appropriate workplace skills and an appreciation of work quality and ethics

There is increasing interest in the forestry certificate program. The question of us offering an Associate's degree is often explored by pending students. The first year with minimal marketing we had three students enroll in the certificate program; there are 4 enrolled for the fall (as of now) 2017; there were 10 students at the last open house in February interested in Forestry. The students currently enrolled in the certificate program are planning to continue with an Associate's degree in Agri Business Management. They have the potential to continue onto UVM, as proposed for future Associate Degree students.

We have 3 students attend the April 2017 open house and 10 registered for try a major day in May.

Statewide there are over 300 students total enrolled in VT CTE Forestry/Natural Resource programs at the high school level. The state of Vermont offers no Associates option in Forestry. With the legislation that was passed in July 2016, Act 166, in order to become a licensed forester in the state of Vermont, you now have to hold at minimum an associates in that field that is SAF accredited.

- 2. Specific student, educational and/ or employment need(s) to be addressed, including in-person, hybrid, low-residency, or distance mode(s) of program delivery, and whether these needs are local, state, regional, national or global (attach documentation of need in the form*

*of supporting data from external or internal sources such as professional organizations, feedback from corporate partners, or market research):*

We conducted local market research assessing student enrollment in VT Ag/NR management CTE programs. We heard back from roughly half of the CTE programs resulting in 217 student enrollment numbers. The majority of these students go out of state for an Associate's degree and pay more for their tuition. The feedback we received from CTE directors and instructors was that students would access an Associates in forestry at Vermont Tech. The spread sheet with CTE results is attached.

Through collaborative conversation with the commissioner of forest and parks, Mike Snyder., there is consensus an Associates program in VT would help build the workforce to ensure a sustainable working forest for the future of VT.

The proposed Associates program and the mapped course flow has been designed to allow the following:

- The first year of courses could be taken at any other VSC college or CCV
  - A majority of the courses could be taken on-line with CCV
  - Allows students to easily transfer into Vermont Tech for the 2<sup>nd</sup> year of core curriculum courses from CCV or another VSC institution
  - Allows students to enter UVM after completion of the Associates degree to receive a BS in Forestry/ Natural Resource Management
  - Allows student to remain at Vermont Tech for a BS in Diversified Agriculture
  - Enhances the course electives for the Diversified Agriculture Degree
3. *How the program will strengthen the System. If the program approximates existing programs within the System, describe why the development of an additional program will serve particular need(s). If it is a distinct program that expands System offerings, please describe what value it offers, any intended collaboration with other VSC colleges or organizations in planning or delivering this program, and, if appropriate, indicate specific benefits to the State of Vermont):*

There currently is no offering of an Associate's degree option in the State of Vermont. With the new licensing law, an Associates will suffice to sit for licensure with mandatory work experience. UVM offer a BS and we would be collaborating with them to develop a 2 + 2 program, currently unfunded with possible promotion to state in future. We had a preliminary meeting with UVM and aligned curriculum. The document is attached. Since an Associate's does not exist within the VSC, this program would support numerous science majors within the VSC who decide to enter the Natural Resource Management/Forestry field. All of the courses that are applicable to the Associate's in forestry, will also be eligible for elective credit in Diversified

Agriculture B.S. UVM feels as though the program will help encourage more VT students to get a forestry education in VT. Currently with 50 Forestry majors at UVM, only 2 completed high school in the state.

**Part III: Program Description**

1. *Specific program objectives, including career and learning outcomes for students:*
  - Create an Vermont based educational pathway for students interested in Forestry and Natural Resource Management
  - Create an educational pathway that meet ACT 166 criteria and allows graduates to test for a license
  - Develop an educational pathway in collaboration with the industry that supports a skills based work force in forestry and natural resource management.
  - Support sustainable harvesting and management of the northern woodlands through an educational program.
  
2. *How the program will integrate professional, liberal and career study:*
  - The program includes an internship where students experience the career of study
  - The program is taught by educators with expertise in the field and practitioners in forestry.
  
3. *What peer programs or model curricula served as a basis for the proposal:*
  - Vermont Tech and UVM currently have a 2 + 2 program for dairy management that we modeled this program after.
  - We used Paul Smiths, NY curriculum to develop the Associates pathway.
  - We will work with SAF ( Society of American Foresters) to accredit the program.
  
4. *How the program will assess its effectiveness in achieving student learning outcomes:*
  - Students are required to pass all courses and demonstrate adequate knowledge in all course objective outcomes.
  - Students will have the opportunity to sit for the state forestry license.
  
5. *How the program incorporates current standards and/or emerging directions in the field, and what the program will require to maintain licensure, certification, or accreditation standards with external entities, if any.*
  - We will maintain all the above by maintain SAF accreditation.
  
6. Program outline; include brief descriptions of all new courses:
  - We have attached all new course outlines in accordance with VSC standards.

Course Name & Number	Credits	New or Existing?
<u>Forest Ecology</u>	<u>4</u>	<u>Existing as of fall 2016</u>

<u>Timber Harvesting</u>	<u>4</u>	<u>Existing as of spring 2017</u>
<u>Dendrology</u>	<u>4</u>	<u>New as of Fall 2017</u>
<u>Forestry Internship</u>	<u>3</u>	<u>New as of Spring 2017</u>

7. TOTAL CREDITS in proposed program:     30
8. TOTAL GENERAL EDUCATION CREDITS beyond those in the program:     33
9. TOTAL CREDITS for the degree:     63
10. For associate and baccalaureate degree programs, provide a 2- or 4-year degree map showing intended semester-by-semester sequence of courses including program courses, general education requirements, and electives. For graduate degree programs, describe the intended timeframe and sequence for completion of the degree.
  - This is attached

Forestry Associate's Course Flow by Semester and Alignment with UVM Forestry program:  
UVM/VTC 2 Plus 2 FORESTRY PROGRAM

FIRST YEAR	UVM	VTC	UVM Equivalency
Fall	NR 1 Natural History & Field Ecology (4) NR 6 Race & Culture in NR (2) RSENGR Gen ed (3) Gen Chem (4)	Survey of Accounting Dendrology (4) Math Math 1210 (3) English 10XX (3) -15 Forest Ecology (4)	Dendrology RSENGR Gen ed RSENGR Gen ed -17 Counts as NR103
Spring	NR 2 (3) RSENGR Gen ed (3) RSENGR Gen ed (3) Intro Botany (4) Elective (4)	Intro Botany Bio 1220 (4) Intro to Soil LAH 1050 (4) Intro spreadsheets & Data Bases CIS 1080 (2) Tech Comm (3) -15 Elective SCC (3) Diesel Engines DSL 1050 preventative, DSL 2030 Hydraulics / Welding MEC 1180 (15-18)	Intro to Botany Intro Soil Econ 12 Micro Economics Elective or Concentration Elective or Concentration
SOPHMORE	RSENGR Gen ed (3) D2 UVM requirement FOR 21 Dendrology For 111 NR ecology & assessment	Gen Chem (4) Timber Harvesting (4) Burs to Boards (3) Financial Management (3) -14 Small Business Management BUS 2210 (3) Maple Production AGR 3040 (3) Forestry Internship (4) Choose 3 Prog Elec XXXX Diesel Engines DSL 1050 preventative (3) / Welding MEC 1180 (3) -14 Diesel Engines DSL 1050 preventative (3) / DSL 2030 Hydraulics (3) / Welding MEC 1180 (3)	Elective or Concentration Elective or Concentration Intro Soil science PSS 161 -17 Econ 12 Micro Economics
Spring	NR103 NR 104 NR140 For 112	Maple Production AGR 3040 (3) Forestry Internship (4) Choose 3 Prog Elec XXXX Diesel Engines DSL 1050 preventative (3) / Welding MEC 1180 (3) -14 Diesel Engines DSL 1050 preventative (3) / DSL 2030 Hydraulics (3) / Welding MEC 1180 (3)	Elective or Concentration Elective or Concentration Elective or Concentration
JUNIOR	NR205 ecosystem Management (3) For 223 Silviculture (4) PSS 161 Intro soils (4) Econ 12 Microeconomics (3)	D2 UVM requirement (3) For 112 NR and ecology (4) NR 95 (4) NR 104 (3)	NR1, NR2 & NR6 -14
Spring	RSENGR Gen ed (3) FOR 233 Wood Lots (3) NR 143 GIS (3) Concentration (4)	FOR 111 NR & Assessment (4) FOR 233 Wood Lots (3) NR 143 GIS (3) For 223 Silviculture (4)	-14
SUMMER	FOR 122 (4)	FOR 122 (4)	-4
SENIOR	NR 206 Enviro prob solving (4) NR 207 Power, privilege, Enviro (1) Concentration (4) Concentration (3) For 235 Forest Ecosystem health (3)	NR 206 Enviro prob solving (4) NR 207 Power, privilege, Enviro (1) FOR 140 Stats (4) Concentration (3) -15 For 235 Forest Ecosystem health (3)	-15
Spring	FOR 182 (1) Elective (3) FOR 272 (4) Concentration (3) FOR 275 (3)	FOR 182 (1) Electives (5) FOR 272 (4) NR 205 ecosystem management (3) -14 FOR 275 (3)	-16 -125
Total Credits	-121	-121	-125





# VERMONT TECH

ELEMENT	CONTENT
DEPARTMENT	Ag
AUTHOR(S)	Molly Willard
COURSE NUMBER	AGR XXXX (fall 2018)- AGR 2910, special topics in Ag
COURSE TITLE	Dendrology
SHORT TITLE	Dendrology
COURSE LEVEL	Entry
DATE CREATED	3/4/17
CHECKED/CHANGED	
PREREQUISITES	None
COREQUISITES	None
RESTRICTIONS	High School Diploma
SPECIAL FEES	None
CREDITS	3 lecture, 1 lab
HOURS	30 hours lab, 45 lecture
SEMESTER	Starting Fall 2018
COURSE DESCRIPTION	The purpose of this course is to introduce students to the study of trees - dendrology. We will study their physiology, taxonomy, silvics, uses, and identification through readings, classroom activities, lectures and discussions, and in outdoor labs.
SUGGESTED TEXTS	Thomas, Peter A. 2014. Trees: Their Natural History (2 <sup>nd</sup> Edition). Cambridge University Press, Cambridge, UK. 401p. (required)  Maine Forest Service. 2008. Forest Trees of Maine (14 <sup>th</sup> Edition). (required; content on web: <a href="http://www.maine.gov/dacf/mfs/publications/handbooks_guides/forest_trees/index.html">http://www.maine.gov/dacf/mfs/publications/handbooks_guides/forest_trees/index.html</a> )
OPTIONAL TEXTS	Harlow, W.M. 1946, 1954. Fruit Key and Twig Key to Trees and Shrubs. Dover. (recommended)
COURSE OUTCOMES	By the end of this course, students should: 1) be able to identify about 100 important tree and shrub species from field samples 2) understand the basic structure of trees and the processes by which they function 3) be familiar with how types of tree are categorized and related to each other 4) know the important ecological and utilization characteristics for trees generally, and for the locally important species specifically

# VERMONT TECH

5) be familiar with a number of species, genera, or families that are important and / or interesting players on the national and international stage

COURSE CONTENT		
<b>FOR 021 Fall 2016 Lecture Schedule (blank lines are "expansion joints" to allow flexibility):</b>		
Week	Topic	Readings (Thomas, else given)
1	course overview; introduction to topic	
1	tree identification terminology	MFS*: 12 – 19
	what is, isn't, or maybe a tree; use of keys in JD	Chp 1; MFS: 9
	silvics	Silvics of N.A.: 1 – 9
2	leaves I	Chp 2: 13 – 28
	classification and nomenclature	Keator: 149 – 153
3	leaves II	Chp 2: 28 – 48
	primary growth and twigs	Chp 6: 224 – 230; 7: 256 – 258
	Conifers I: Pinales and cone dissection	Farjon, Chps 1, 3
4	wood formation and structure	Chp 3: 51 – 63, 77 – 83
	Wood I and dendrochronology	Chp 6: 222-224; Speer: Chp 4
5	dendrochronology activity and look at wood	Stokes and Smiley xx-xx
	Conifers II: Cupressales and other gymnosperms	Farjon, Chps 13, 16
	Growing trees from seed, breeding, nursery ops.	
	wood function	Chp 3: 63 – 77, 97 – 99
6	bark (Videos!!!)	Chp 3: 83 – 92
	Asterids	
	Forest Physiology (forests of the world added	TBA
7	silvics activity	
	roots and nutrition	Chp 4
	<b>midterm exam</b>	
8	Fabids I: Fagales	TBA
	Wood II: properties and products (videos?)	TBA
	flowers / strobili and pollination	Chp 5: 154 – 184
9	Fabids II: Rosales and others	
	fruits / cones and seed dispersal	Chp 5: 184 – 202
	regeneration	Chp 8
10	Maple	
	Tree genetics	TBA
11	Malvids (very short – quiz!)	

# VERMONT TECH

	growth regulation, phenology Other Eudicots, Magnoliids, and Monocots	Chp 6: 214 – 222, 230 – 242
	Wood III: Identification	Hoadley 46 – 54
	Lumber and wood construction	TBA
12	tree branch and crown architecture	Chp 3: 92 – 97; Chp 7
	growth limits (where and why of biggest, oldest)	Chp 6: 205 – 214
13	ID review for lab final – Pictionary?	
	injury response, senescence, mortality	Shigo 1979, Chp 9
	important forest types of the U.S.	TBA
14	review and course evaluations	
	Final wrap-up, bonus turn-in	
15	<b>Final Exam:</b>	
* MFS = Maine Forest Service. 2008. Forest Trees of Maine (14 <sup>th</sup> ed.).		
<b>FOR 021 Fall 2016 Lab Schedule:</b>		
Week	Location	Species to be introduced ( <i>tentative lists, subject to change!</i> )
1	TBD	sugar, red, striped maple; chestnut; beech; yellow, paper birch; fir; hemlock; red, white pine; northern white-cedar; tulip-poplar; butternut; black walnut;
2	TBD	hackberry; silver maple; boxelder; elderberry; basswood; red, white, black oak; black willow; white, green ash; alder; hornbeam; bitternut hickory; hophornbeam; cottonwood; wild grape; poison ivy
3	TBD	pin, black, choke cherry; bigtooth, quaking aspen; glossy buckthorn; honeysuckle; <i>Rubus</i> ; hobblebush; witch-hazel; oriental bittersweet; larch spp.; -hawthorn
4	TBD	sycamore; dogwood spp.; black locust; gray, black birch; American, common apple; sumac; Norway maple; common buckthorn;
5	TBD	pin, swamp white oak; Scots, Austrian pine; blue, Norway, white spruce; ornamental yew; river birch; Norfolk Island-pine; honeylocust; Kentucky coffeetree; Douglas-fir; ginkgo; horsechestnut, Siberian elm

# VERMONT TECH

	6	TBD	mountain-ash; red spruce; lowbush blueberry; mountain maple; mountain paper birch; Canada yew; gooseberry; serviceberry; balsam poplar
	7	TBD	shagbark hickory; bur oak; black ash
	8	TBD	black tupelo; black spruce; tamarack; highbush blueberry; pitch pine;
	9	TBD	Lilac, other missed species; catch-up and review
	10	TBD	common juniper; eastern redcedar
	11	TBD	TBD
	12	TBD	burning bush; white fir; weeping willow; baldcypress; peduncle, 3 catalpa; rhododendron; mugo pine; redbud; crabapple; Lombardy poplar; Amur maple, other interesting trees
	14	<b>Exam – TBD</b>	Potentially everything!
LAB OUTCOMES	<p>Be able to identify the following:</p> <p><u>Species (tentative list...):</u>                  Species to know thoroughly (by <i>any one part</i> - bark, fruit, twigs, leaves – and at any age/size).                  All are either very distinctive or very important locally, or both. You will also be expected to know the silvical characteristics of these species (i.e., life history):                  American basswood , American beech, American sycamore, aspen sp.* , balsam fir , black cherry, black locust , bitternut hickory , dogwood sp. , eastern cottonwood , eastern hemlock elm sp.</p>		

# VERMONT TECH

Hophornbean, larch sp., northern whitecedar, paper birch, pitch pine, poison ivy, red/black oak, red maple, red pine, *Rubus* sp., shagbark hickory, speckled alder, spruce sp., staghorn sumac, striped maple, sugar maple, walnut/butternut, willow sp., white/green ash, white oak, white pine, yellow birch

\* Some genera contain two or more similar-looking species, which may occur separately in lists below. On this list, you should recognize a tree as a member of its genus by any one aboveground part.

Species to recognize at least by their twigs – all of the above, plus:

American elm, barberry sp., beaked hazel, black ash, black walnut, boxelder, butternut, choke cherry, common buckthorn, common juniper, eastern red cedar, elderberry sp., gray birch, green ash, honeysuckle sp., lilac, pin cherry, red/black, spruce, serviceberry, slippery elm, white ash, white/Norway/blue spruce, witch-hazel, yew sp.

Species to recognize given multiple parts and context, or be able to key out (any in first and second lists, plus):

alternate-leaf dogwood, American chestnut, American mountain-ash, Austrian pine, balsam poplar, bigtooth aspen, bittersweet sp. black birch, black tupelo, blue spruce, bur oak, Canada yew, common apple Douglas-fir, exotic larch sp., ginkgo, glossy buckthorn, hackberry, hawthorn sp., hobblebush, honeylocust, horse chestnut, littleleaf linden, mountain maple, Norfolk Island-pine, northern catalpa, Norway maple, Norway spruce, ornamental yew, pin oak, quaking aspen, river birch, Scots pine, silver maple, speckled alder, swamp white oak, tamarack, tulip-poplar, white spruce, wild grape

*Additional introductions* that may be found, especially on campus or in town (if introduced, must be recognized as above, Latin name and family learned):

Alaska-cedar, baldcypress, Callery pear, chestnut oak, dawn-redwood, devil's walkingstick, English oak, European larch, jack pine, Japanese larch, Kentucky coffeetree, Lombardy poplar, mountain paper birch, mugo pine, ponderosa pine, redbud, *Rhododendron* spp., sassafras, shingle oak, southern magnolia, weeping willow, white fir

to *know by wood*:

# VERMONT TECH

	<p>ring-porous: red oaks, white oaks, ash, walnut (semi r-p) diffuse-porous: beech, maple, birch, cherry, tulip-poplar conifers: "cedars", soft pines, hard pines/spruce/Doug-fir/larch</p> <p>Species will be introduced close to the order given in the lab schedule above (some deviation from plans is inevitable). You'll notice that the schedule is front-heavy, with the bulk of introductions coming early in the term. There are a couple of reasons for this. First is that by mid-October, most of the leaves will have fallen from the deciduous trees, and we want to introduce as many species as possible before then (important note, however: you will be expected to identify many of these species with or without leaves). Second, I want you to learn some of these trees very thoroughly, so that you'll recognize them by any part or by a specimen of any size or condition. That takes time and practice to train the eye, so we want to introduce the most important species as early as we can, so you can see them over and over again. Third, quizzes will take up an increasing proportion of lab time relative to new species introductions, as will discussion of already-introduced species' silvics (ecological characteristics).</p>
<p><b>GRADED OR P/NP EVALUATION</b></p>	<p><b>Grade</b></p> <p><b>Grading:</b></p> <p>Silvics paper &amp; species profile sheet 15%</p> <p>Mid-term exam 15%</p> <p>Final Exam 20%</p> <p>Weekly lecture quizzes and activities 15%</p> <p>Weekly lab quizzes 20%</p> <p>Final lab exam 15%</p>
<p><b>DELIVERY METHOD ROOM REQUIREMENT</b></p>	<p>Lecture and Lab Lecture/lab in a room with microscopes</p>
<p><b>AUTHOR'S NOTES</b></p>	<p>This syllabus is in line with UVM's to meet their requirements for transfer students.</p>

# VERMONT TECH

ELEMENT	CONTENT
DEPARTMENT	MAT
AUTHOR (S)	
COURSE NUMBER	<b>MAT 1210</b>
COURSE TITLE	<b>Principles of Mathematics</b>
SHORT TITLE	Principles of Math
COURSE LEVEL	1000
DATE CREATED	
CHECKED/CHANGED	6/2/2017
PREREQUISITES	Placement level 2
COREQUISITES	
RESTRICTIONS	
SPECIAL FEES	No
CREDITS	3
HOURS	3 hours of lecture per week
SEMESTER	Fall, Spring
COURSE DESCRIPTION	This course is a review of general mathematics principles and an introduction to concepts for the solution of agricultural, agribusiness, and business problems. Topics covered include calculator use; basic algebraic operations, solution of linear and quadratic equations; geometry concepts of line, area, and volume; variation; trigonometry of right triangles; growth; compound interest; debt amortization; probability; and statistics.
SUGGESTED TEXTS	
OPTIONAL TEXTS	
COURSE OUTCOMES	
COURSE CONTENT	
LAB/STUDIO OUTCOMES	
LAB/STUDIO CONTENT	
LECTURE CAPACITY	25
LAB CAPACITY	
GRADED OR P/NP	Graded
EVALUATION	
DELIVERY METHOD	Lecture
ROOM REQUIREMENTS	
AUTHOR'S NOTES	





# VERMONT TECH

ELEMENT	CONTENT
DEPT OR PROGRAM	ENG
AUTHOR (S)	Jeff Higgins
COURSE NUMBER	ENG 1060
COURSE TITLE	Freshman Composition
SHORT TITLE	
COURSE LEVEL	1000
DATE CREATED	
CHECKED/CHANGED	May 2016
PREREQUISITES	Placement level 2
COREQUISITES	
RESTRICTIONS ON ENROLLMENT	
SPECIAL FEES	
CREDITS	3
HOURS	3 hours lecture
SEMESTER	Fall/Spring
COURSE DESCRIPTION	Students are expected to read and think critically, to write effectively, and to understand the fundamentals of literary analysis and written composition. Classroom discussion of assigned readings and the construction of related essays are stressed. A required research paper demonstrates the student's use of resources in locating, organizing, and presenting materials in an accepted format. The Writing Graduation Standard is assessed in this course. This course is writing-intensive.
REQUIRED TEXTS	Determined by Instructor
OPTIONAL TEXTS	
COURSE OUTCOMES	<p>English 1060 is a Basic Skills English composition course. Upon completion, students are qualified for ENG 2080, Technical Communication.</p> <p>Student learning objectives:</p> <ul style="list-style-type: none"> <li>• Developing an awareness of the relationship among writer, subject, audience, and purpose;</li> <li>• Focusing written work around an explicit or an implied central thesis;</li> <li>• Developing the central thesis systematically, using specific details and supporting evidence;</li> <li>• Using correct grammar, syntax, punctuation, and spelling;</li> <li>• Following standard practices in quotation, summary, paraphrase, and citation of textual material;</li> </ul>

# VERMONT TECH

	<ul style="list-style-type: none"> <li>Developing critical reading skills for dealing with college-level materials.</li> </ul> <p>At the conclusion of the course, students are assessed for the VTC Graduation Standard for Writing, which all students must successfully pass before receiving their degrees.</p>																								
<b>COURSE CONTENT</b>	<p style="text-align: right;"><u>Recitation Periods</u></p> <table border="0"> <tr> <td>I. Writing as a process</td> <td style="text-align: right;">3</td> </tr> <tr> <td>II. Word processing</td> <td style="text-align: right;">2</td> </tr> <tr> <td>III. Paragraph development</td> <td style="text-align: right;">3</td> </tr> <tr> <td>IV. Writing beginnings and endings</td> <td style="text-align: right;">3</td> </tr> <tr> <td>V. Expressive writing (informal writing)</td> <td style="text-align: right;">2</td> </tr> <tr> <td>VI. Informative writing</td> <td style="text-align: right;">1</td> </tr> <tr> <td>VII. Argumentative writing</td> <td style="text-align: right;">1</td> </tr> <tr> <td>VIII. Principles of research</td> <td style="text-align: right;">12</td> </tr> <tr> <td>IX. Revision and proofreading</td> <td style="text-align: right;">3</td> </tr> <tr> <td>X. Individual conferences</td> <td style="text-align: right;">6</td> </tr> <tr> <td>XI. Discussions of readings</td> <td style="text-align: right;">6</td> </tr> <tr> <td>XII. Quizzes, tests, exercises</td> <td style="text-align: right;">3</td> </tr> </table>	I. Writing as a process	3	II. Word processing	2	III. Paragraph development	3	IV. Writing beginnings and endings	3	V. Expressive writing (informal writing)	2	VI. Informative writing	1	VII. Argumentative writing	1	VIII. Principles of research	12	IX. Revision and proofreading	3	X. Individual conferences	6	XI. Discussions of readings	6	XII. Quizzes, tests, exercises	3
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<b>LABORATORY / STUDIO OUTCOMES</b>																									
<b>LABORATORY / STUDIO CONTENT</b>																									
<b>GRADED OR P/NP</b>	Graded																								
<b>SUGGESTED EVALUATION</b>	<p>Minimum of five 500 word essays (one must be a precursor to the research paper)</p> <ul style="list-style-type: none"> <li>- a research paper (2500 to 3000 words)</li> <li>- quizzes and tests</li> <li>- homework exercises</li> <li>- informal writing</li> <li>- oral presentations</li> <li>- class participation, attendance</li> </ul>																								
<b>DELIVERY METHOD</b>	Classroom and Conferences (i.e. individualized instruction)																								
<b>ROOM</b>																									

# VERMONT TECH

REQUIREMENTS	
AUTHOR'S NOTES	



# VERMONT TECH

ELEMENT	CONTENT
DEPARTMENT	AGR
AUTHOR (S)	Molly Willard
COURSE NUMBER	AGR 1241
COURSE TITLE	Introduction to Forest Ecology
SHORT TITLE	Intro to Forest Ecology
COURSE LEVEL	1000
SHARED VSC COURSE	No
DATE CREATED	12/2/2015
CHECKED/CHANGED	6/12/2017
PREREQUISITES	
	Prerequisite must be taken previously <input type="checkbox"/>
COREQUISITES	
	Corequisite must be taken concurrently <input type="checkbox"/>
RESTRICTIONS	
SPECIAL FEES	No
CREDITS	4
CROSS-LIST	
HOURS	3 hours of lecture, 3 hours of lab per week
SEMESTER	Fall
COURSE DESCRIPTION	Through this course, the student gains an understanding of the functions of a forest ecosystem and learns tree identification, silviculture practices, and the significance of natural communities such as vernal pools and wetlands. A central component of this course is a lab in which the student studies the natural communities that comprise the VTC forest.
SUGGESTED TEXTS	
OPTIONAL TEXTS	
COURSE OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Identify Vermont trees</li> <li>2. Understand nutrient cycling within a forest ecosystem</li> <li>3. Identify significant natural communities based on plant growth</li> <li>4. Implement and understand silviculture practices</li> <li>5. Understand the environmental significance of protected ecotypes such as wetlands</li> </ol>
COURSE CONTENT	<ol style="list-style-type: none"> <li>1. Tree identification</li> <li>2. Nutrient cycling in forests</li> <li>3. Identification of natural communities and their role in an ecosystem</li> <li>4. Specific species silviculture practices</li> <li>5. Identification of protected ecosystems and their role</li> </ol>
LAB/STUDIO OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Demonstrate proficiency in tree and plant identification</li> <li>2. Identify natural communities</li> <li>3. Analyze soil for moisture, density, pH</li> <li>4. Conduct saturated media analysis for nutrients</li> <li>5. Identify loss if ignition (LOI) organic matter, organic carbon</li> <li>6. Identify management impacts and best practices to use under different forest situations</li> </ol>
LAB/STUDIO CONTENT	<ol style="list-style-type: none"> <li>1. Tree and plant identification</li> <li>2. Natural community identification</li> <li>3. Soil typing and soil nutrient cycling</li> <li>4. Using plants to determine soil types</li> <li>5. Techniques for measuring stand basal area</li> <li>6. Best practice management to maintain healthy forest ecosystems while harvesting trees</li> </ol>
LECTURE CAPACITY	32
LAB CAPACITY	16
GRADED OR P/NP	Graded
EVALUATION	
DELIVERY METHOD	LEC, LAB
ROOM REQUIREMENTS	CLK 210 for LAB
AUTHOR'S NOTES	



# VERMONT TECH

ELEMENT	CONTENT
DEPARTMENT	LDSH
AUTHOR (S)	Marlys Eddy
COURSE NUMBER	BIO 1220
COURSE TITLE	Botany
SHORT TITLE	Botany
COURSE LEVEL	1000
SHARED VSC COURSE	Yes
DATE CREATED	
CHECKED/CHANGED	5/2017
PREREQUISITES	
	Prerequisite must be taken previously <input type="checkbox"/>
COREQUISITES	
	Corequisite must be taken concurrently <input type="checkbox"/>
RESTRICTIONS	
SPECIAL FEES	No
CREDITS	4
CROSS-LIST	
HOURS	3 hours of lecture, 3 hours of lab per week
SEMESTER	Spring
COURSE DESCRIPTION	This course provides the student with an understanding of the fundamentals of plant growth and development. Higher plant structure, metabolism, growth regulators, and mineral nutrition are emphasized. The student also becomes acquainted with the diversity of plants and plant-like organisms through the study of bacteria, viruses, algae, fungi, mosses, and lower vascular plants.
SUGGESTED TEXTS	<i>Introductory Plant Biology</i> ; Kingley R. Stern <i>Introductory Plant Biology Laboratory Manual</i> ; Kingley R. Stern
OPTIONAL TEXTS	
COURSE OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Name and explain the disciplines within plant biology and the history of its development</li> <li>2. Model, describe, and explain plant growth and development including mitosis, meiosis, and plant hormones</li> <li>3. Draw and label plant anatomy</li> <li>4. Explain the process of the light and dark reactions of photosynthesis and the significance of photosynthesis</li> <li>5. Explain water movement through the plant and contrast different types of water movement</li> <li>6. Compare and contrast micronutrients and macronutrients; provide examples of each.</li> <li>7. Explain the significance in the plant body of the elements required for plant growth</li> <li>8. Use the scientific classification and naming system, provide examples of its benefits, and describe how it was developed</li> <li>9. Categorize organisms to kingdom and categorize plants to phylum level.</li> <li>10. Describe characteristics of gymnosperms and angiosperms and contrast the two groups</li> <li>11. Explain plant reproduction and the alternation of generations in the plant lifecycle at the cellular level using technical terms</li> <li>12. Name and describe the drivers of evolution on a large and small scale</li> <li>13. Explain the basic history of the theory of evolution</li> </ol>
COURSE CONTENT	<ol style="list-style-type: none"> <li>1. Introduction and course requirements</li> <li>2. Botany as a science</li> <li>3. Divisions</li> <li>4. Nature of life</li> <li>5. Cells</li> <li>6. Tissues</li> <li>7. Roots</li> <li>8. Stems</li> <li>9. Leaves</li> <li>10. Flowers, Fruits, and Seeds</li> <li>11. Water in Plants</li> <li>12. Plant Metabolism: photosynthesis, respiration</li> <li>13. Hormonal control of plant growth</li> <li>14. Meiosis</li> <li>15. Plant names and classification</li> <li>16. Evolution</li> <li>17. Algae, fungi, mosses, gymnosperms</li> <li>18. Angiosperms</li> <li>19. Ecology</li> </ol>
LAB/STUDIO OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Effectively use a microscope</li> </ol>



# VERMONT TECH

	<ol style="list-style-type: none"> <li>2. Label, diagram, and explain the function and significance of plant anatomy from the microscopic to the macroscopic level</li> <li>3. Model and explain the processes of mitosis and meiosis</li> <li>4. Participate in service learning and provide examples of local ecological conservation efforts</li> </ol>
LAB/STUDIO CONTENT	<ol style="list-style-type: none"> <li>1. The microscope</li> <li>2. The cell</li> <li>3. Mitosis</li> <li>4. Roots</li> <li>5. Stems</li> <li>6. Leaves</li> <li>7. Flowers</li> <li>8. Fruits and spices</li> <li>9. Cell components and products: hormones</li> <li>10. Meiosis</li> <li>11. Gymnosperms</li> <li>12. Angiosperms</li> <li>13. Flowering plants</li> <li>14. Ecology</li> <li>15. Conservation project</li> </ol>
LECTURE CAPACITY	32
LAB CAPACITY	16
GRADED OR P/NP	Graded
EVALUATION	Exams, assignments, attendance, participation
DELIVERY METHOD	LEC, LAB
ROOM REQUIREMENTS	CLK 210 for lab
AUTHOR'S NOTES	

# VERMONT TECH

ELEMENT	CONTENT																														
DEPARTMENT	LDSH																														
AUTHOR (S)	Clotilde Hryshko																														
COURSE NUMBER	LAH 1050																														
COURSE TITLE	Introduction to Soils																														
SHORT TITLE	Intro to Soils																														
COURSE LEVEL	1000																														
DATE CREATED	2008																														
CHECKED/CHANGED	3/2017																														
PREREQUISITES																															
COREQUISITES																															
RESTRICTIONS																															
SPECIAL FEES	No																														
CREDITS	4																														
HOURS	3 hours of lecture, 2 hours of lab per week																														
SEMESTER	Spring																														
COURSE DESCRIPTION	Subject areas covered include soil formation and classification and the ways in which chemical, physical, and biological properties of soil affect plant growth. The course also examines issues related to soil temperature, aeration, organic matter, and tilth. Practices best suited to erosion control and nutrient management are explored. Students learn about soil testing and the most effective liming and fertilizing practices for sustainable management. The college, home gardens, and local farms are used in soil and fertilizer analysis.																														
SUGGESTED TEXTS	<i>Elements of Nature and Properties of Soil</i> ; N.C. Brady & R.R. Weil																														
OPTIONAL TEXTS																															
COURSE OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Relate soil formation factors to different geographical regions and specifically to the northeastern United States</li> <li>2. Generally describe how and why northeastern soils formed and their relation to climate and biota</li> <li>3. Understand what texture, structure, color, bulk density, and soil tilth are and how they relate to a specific soil</li> <li>4. Describe how these properties affect a soils suitability to various uses and/or managements</li> <li>5. Understand different fates of water within soils and watersheds</li> <li>6. Understand chemical and physical properties of water and relate to the physical properties of soils with respect to soil management</li> <li>7. Understand soil pH, its measurement, and its importance in regulating cation exchange capacity (CEC) and nutrient availability</li> <li>8. Assess organic matter for its carbon to nitrogen ratio and relationship to appropriate uses as an amendment</li> <li>9. Understand forms that plants take nutrients up and relationship to CEC and organic matter</li> <li>10. Understand various methods for nutrient and land management and relationship to environmental quality</li> </ol>																														
COURSE CONTENT	<table border="1"> <thead> <tr> <th>Content</th> <th>Hours</th> </tr> </thead> <tbody> <tr> <td>Course overview: soil as a system</td> <td>1</td> </tr> <tr> <td>Soil/plant interactions</td> <td>2</td> </tr> <tr> <td>Soil formation and classification</td> <td>4</td> </tr> <tr> <td>Physical properties: texture</td> <td>3</td> </tr> <tr> <td>Physical properties: color and structure</td> <td>1</td> </tr> <tr> <td>Physical properties: bulk density and soil tilth</td> <td>2</td> </tr> <tr> <td>Soil water: forms and availability</td> <td>5</td> </tr> <tr> <td>Soil aeration and temperature</td> <td>3</td> </tr> <tr> <td>Soil colloids and cation exchange capacity</td> <td>4</td> </tr> <tr> <td>pH and soil organic matter</td> <td>4</td> </tr> <tr> <td>Soil liming and calcium</td> <td>1</td> </tr> <tr> <td>Soil nitrogen and sulfur</td> <td>3</td> </tr> <tr> <td>Soil phosphorus, potassium, and micronutrients</td> <td>2</td> </tr> <tr> <td>Nutrient management and conservation</td> <td>2</td> </tr> </tbody> </table>	Content	Hours	Course overview: soil as a system	1	Soil/plant interactions	2	Soil formation and classification	4	Physical properties: texture	3	Physical properties: color and structure	1	Physical properties: bulk density and soil tilth	2	Soil water: forms and availability	5	Soil aeration and temperature	3	Soil colloids and cation exchange capacity	4	pH and soil organic matter	4	Soil liming and calcium	1	Soil nitrogen and sulfur	3	Soil phosphorus, potassium, and micronutrients	2	Nutrient management and conservation	2
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LAB/STUDIO OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Identify the major horizons in an outdoor soil pit and describe them with respect to texture, color, and structure</li> <li>2. Relate basic water chemistry to a soils seasonal temperature and its available water</li> <li>3. Determine soil texture (feel method) and relate it to bulk density, pore size, overall pore space, and % organic matter</li> <li>4. Describe the general flow of water in a soil profile and how it will differ with various textures</li> <li>5. Understand how to read and use soil surveys</li> <li>6. Demonstrate how to measure soil pH and interpret soil test results</li> <li>7. Demonstrate how to evaluate cover crops for various uses</li> </ol>																														

# VERMONT TECH

	<ol style="list-style-type: none"> <li>8. Measure surface residue on a soil and describe general methods to prevent soil erosion and eutrophication</li> <li>9. Publically speak to a personal/academic interest and how it relates to soils</li> </ol>
LAB/STUDIO CONTENT	<ol style="list-style-type: none"> <li>1. Lab overview and expectations</li> <li>2. Soil composition and parent materials</li> <li>3. Water chemistry</li> <li>4. Soil texture and color</li> <li>5. Bulk density and %pore space</li> <li>6. Bulk density and organic matter</li> <li>7. Water movement in soil profiles</li> <li>8. Soil surveys</li> <li>9. Acids and bases, soil ph</li> <li>10. Soil testing</li> <li>11. Cover crops</li> <li>12. Soil horizons</li> <li>13. Soil conservation</li> <li>14. Student presentations</li> </ol>
LECTURE CAPACITY	32
LAB CAPACITY	16
GRADED OR P/NP	Graded
EVALUATION	Attendance, exams, labs
DELIVERY METHOD	Lecture, Lab
ROOM REQUIREMENTS	GRE 113 for lab
AUTHOR'S NOTES	

# VERMONT TECH

ELEMENT	CONTENT
DEPARTMENT	BUS
AUTHOR (S)	
COURSE NUMBER	CIS 1080
COURSE TITLE	Introduction to Spreadsheets & Database Management
SHORT TITLE	Intro Sprdsht/Db
COURSE LEVEL	1000
DATE CREATED	
CHECKED/CHANGED	6/6/2017
PREREQUISITES	
COREQUISITES	
RESTRICTIONS	
SPECIAL FEES	No
CREDITS	2
HOURS	2 hours of lab per week
SEMESTER	Fall, Spring
COURSE DESCRIPTION	This course introduces the student to email, Web Services, and the internet, as well as spreadsheets and databases. Spreadsheet topics include all functions necessary to build a spreadsheet and create graphs. Database topics include the fundamentals of computer database design and management.
SUGGESTED TEXTS	
OPTIONAL TEXTS	
COURSE OUTCOMES	
COURSE CONTENT	
LAB/STUDIO OUTCOMES	
LAB/STUDIO CONTENT	
LECTURE CAPACITY	
LAB CAPACITY	18
GRADED OR P/NP	Graded
EVALUATION	
DELIVERY METHOD	Lab
ROOM REQUIREMENTS	Computer lab
AUTHOR'S NOTES	



# VERMONT TECH

## ENG2080 Technical Communications

ELEMENT	CONTENT
DEPT OR PROGRAM	English
AUTHOR (S)	Higgins
COURSE NUMBER	ENG2080
COURSE TITLE	Technical Communications
SHORT TITLE	
COURSE LEVEL	2000
DATE CREATED	
CHECKED/CHANGED	2014
PREREQUISITES	Freshman Composition or equivalent
COREQUISITES	
RESTRICTIONS ON ENROLLMENT	
SPECIAL FEES	
CREDITS	3
HOURS	3 hours lecture
SEMESTER	Fall and Spring
COURSE DESCRIPTION	A comprehensive study of the principles, methods, and forms needed to produce clear and effective communications and technical reports, both written and oral. The course stresses business correspondence, and the use of graphics in documents and oral presentations. A major technical report integrated within the student's major program curriculum is also required and will be used for assessment of the VTC Writing Graduation Standards.
REQUIRED TEXTS	Lannon, <i>Technical Communications</i>
OPTIONAL TEXTS	
COURSE OUTCOMES	<p>ENG 2080, Technical Communication, instructs students in professional-level technical writing and oral presentation. All students in degree programs at Vermont Technical College must complete ENG 2080 in order to graduate. Upon completion of ENG 2080, students are ready to pursue and succeed in careers through a variety of means: Internet resources, paper media, professional networks, and personal interviews.</p> <p>Student learning objectives:</p> <ul style="list-style-type: none"> <li>• Reviewing and strengthening college-level writing and editing skills;</li> <li>• Developing job search skills;</li> <li>• Developing oral communication skills;</li> <li>• Understanding the distinctive qualities of technical writing;</li> <li>• Recognizing and creating different types of technical reports including a technical research report integrated within the student's major program curriculum;</li> <li>• Acquiring, evaluating, and interpreting data from a variety of sources;</li> <li>• Presenting data in reports and oral presentations;</li> <li>• Preparing and using visual aids in reports and oral</li> </ul>

# VERMONT TECH

	<p style="text-align: center;">presentations. <span style="float: right;">i</span></p> <p>At the conclusion of the course, students are assessed for the VTC Graduation Standard for Writing, which all students must successfully pass before receiving their degrees.</p>
<p>COURSE CONTENT</p>	<p>I. Writing Mechanics              A. Grammar Review              B. Sentence Structure              C. Punctuation</p> <p>II. Writing Tasks (choose 6 and Technical Report)              A. Definition              B. Instructions              C. Description              D. Proposal              E. Memo              F. Short Report (progress)              G. Letter of Inquiry              H. Technical Report              I. Resume and Cover Letter (in first month)</p> <p>III. Graphics              A. Charts              B. Graphs              C. Tables              D. Diagrams              E. Illustrations              F. Computer Applications</p> <p>IV. Electronic Mail              A. Effectiveness              B. Etiquette</p> <p>V. Technical Report (MLA or APA format)              A. Letter of Transmittal              B. Abstract              C. Table of contents              D. List of figures              E. Headings              F. Statement of Need              G. Goals/Objective              H. Background              I. Body/Proof              J. Budget (if appropriate)              K. Conclusion              L. Works Cited/References</p> <p>Oral Presentations              VI. Speech Preparation                  A. Delivery                      1. Verbal Cues                      2. Nonverbal Cues              Audience Analysis</p>

# VERMONT TECH

LABORATORY / STUDIO OUTCOMES	
LABORATORY / STUDIO CONTENT	
GRADED OR P/NP	Graded
SUGGESTED EVALUATION	<ul style="list-style-type: none"><li>• Minimum of 8 professional documents (see Writing Tasks and Graphics)</li><li>• Technical Report (8-10 pages)</li><li>• Quizzes (optional)</li><li>• Homework Exercises (optional)</li><li>• Oral Presentation</li></ul>
DELIVERY METHOD	Classroom and ONLINE
ROOM REQUIREMENTS	
AUTHOR'S NOTES	





# VERMONT TECH

ELEMENT	CONTENT
DEPARTMENT	SCI
AUTHOR (S)	Joan Richmond-Hall
COURSE NUMBER	<b>CHE 1031</b>
COURSE TITLE	<b>General Chemistry I</b>
SHORT TITLE	Gen Chemistry I
COURSE LEVEL	1000
SHARED VSC COURSE	Yes
DATE CREATED	
CHECKED/CHANGED	6/12/2017
PREREQUISITES	
	Prerequisite must be taken previously <input type="checkbox"/>
COREQUISITES	
	Corequisite must be taken concurrently <input type="checkbox"/>
RESTRICTIONS	
SPECIAL FEES	No
CREDITS	4
CROSS-LIST	
HOURS	3 hours of lecture, 3 hours of lab per week
SEMESTER	As required
COURSE DESCRIPTION	This course is intended for the engineering student and consists of the fundamentals of general and physical chemistry. Lab experiments reinforce concepts introduced in lectures; teach basic laboratory skills and techniques; and introduce some methods of analysis currently used in industry. Fundamental quantitation and analytical techniques are emphasized.
SUGGESTED TEXTS	<i>Chemistry: the Central Science</i> ; Brown, LeMay, Bursten
OPTIONAL TEXTS	<i>General Chemistry</i> ; Olmsted & Williams
COURSE OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Demonstrate mastery of knowledge, techniques, skills, and modern tools</li> <li>2. Apply current knowledge and adapt to emerging applications</li> <li>3. Conduct, analyze, and interpret experiments and apply experimental results</li> <li>4. Communicate effectively</li> <li>5. Commit to quality, timeliness, and continuous improvement</li> </ol>
COURSE CONTENT	<ol style="list-style-type: none"> <li>1. Chemical safety issues</li> <li>2. Preparing and working with a variety of widely used chemical reagents</li> <li>3. Converting molecules to moles to atoms</li> <li>4. Units and methods of quantitation used in chemistry</li> <li>5. Identifying and naming atoms, ions, and molecules</li> <li>6. Predicting and balancing chemical equations</li> <li>7. Various types of chemical reactions</li> <li>8. Thermodynamics, chemical equilibria, and kinetics</li> </ol>
LAB/STUDIO OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Understand the scientific method</li> <li>2. Understand basic laboratory technique</li> <li>3. Collect data and produce results in a lab</li> <li>4. Use scientific notation and significant figures in calculations</li> <li>5. Write a detailed lab report which communicates findings supported by organized and analyzed data</li> <li>6. Think critically about data produced in laboratory experimentation</li> </ol>
LAB/STUDIO CONTENT	<ol style="list-style-type: none"> <li>1. Lab safety training</li> <li>2. How to think like a scientist: putting the scientific method into practice</li> <li>3. Naming chemical compounds</li> <li>4. Measurement, density, and salinity</li> <li>5. Formation of ionic compounds by acid oxidation</li> <li>6. Precipitation, limiting reactants, and theoretical yields</li> <li>7. Acid strength and titration</li> <li>8. Titration and buffering: neutralizing potential of commercial antacids</li> <li>9. Electron configuration of atoms and ions</li> <li>10. Lewis dot structures and molecular geometry</li> <li>11. Exploration and demonstration of the ideal gas law</li> <li>12. Reaction rates and redox reactions</li> <li>13. Reaction kinetics: the iodine clock reaction</li> <li>14. Review for the final exam</li> </ol>
LECTURE CAPACITY	32
LAB CAPACITY	16
GRADED OR P/NP	Graded
EVALUATION	Homework, quizzes, lab reports, exams

# VERMONT TECH

DELIVERY METHOD	LEC, LAB
ROOM REQUIREMENTS	CHE lab for LAB
AUTHOR'S NOTES	

# VERMONT TECH

<b>ELEMENT</b>	<b>CONTENT</b>
DEPARTMENT	AGR
AUTHOR (S)	Molly Willard
COURSE NUMBER	AGR 1062
COURSE TITLE	Timber Harvesting
SHORT TITLE	Timber Harvesting
COURSE LEVEL	1000
SHARED VSC COURSE	No
DATE CREATED	12/2/2015
CHECKED/CHANGED	5/24/2017
PREREQUISITES	
	Prerequisite must be taken previously <input type="checkbox"/>
COREQUISITES	
	Corequisite must be taken concurrently <input type="checkbox"/>
RESTRICTIONS	
SPECIAL FEES	No
CREDITS	4
CROSS-LIST	
HOURS	3 hours of lecture, 3 hours of lab per week
SEMESTER	Spring
COURSE DESCRIPTION	Through this course, the student gains an understanding of timber harvesting equipment operation, maintenance, and safety. The student assesses land for proper skid trails, landings, and access and erosion control. Harvesting ethics and laws such as trespassing are discussed. The student learns how to find land boundaries using tax maps.
SUGGESTED TEXTS	
OPTIONAL TEXTS	
COURSE OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Understand the applications of specific timber harvesting equipment</li> <li>2. Demonstrate basic skills to maintain and safely operate equipment</li> <li>3. Create a management plan for a plot of land including skid trails and landings</li> <li>4. Understand the importance of soil management during harvesting including prevention of soil erosion</li> <li>5. Understand varying perspectives of harvesting ethics and laws</li> <li>6. Read and create land maps</li> </ol>
COURSE CONTENT	<ol style="list-style-type: none"> <li>1. Identifying when timber is ready for harvest</li> <li>2. How to develop a sustainable management plan to ensure continual growth and harvest of the land</li> <li>3. Various types of equipment, safety practices, and the pros and cons that go along with specific pieces of equipment</li> <li>4. Forest soil and how timber harvesting disrupts soil: best practices for soil while harvesting timber</li> <li>5. The laws that all foresters and loggers should be privy to (e.g., the heavy cut law)</li> <li>6. How to read and create a map for timber harvesting purposes</li> </ol>
LAB/STUDIO OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Understand the various types of equipment used on a timber harvesting job</li> <li>2. Assess harvesting jobs for best practices management and legal regulations</li> <li>3. Use VTC forest land to plan and map out a timber harvesting job</li> </ol>
LAB/STUDIO CONTENT	<ol style="list-style-type: none"> <li>1. Assessing a harvesting job for quality and best management practices</li> <li>2. Understanding various pieces of equipment, their efficiencies, and what timber harvesting plans they are best suited for</li> <li>3. Assessing a piece of forested land for a current use plan including timber harvest</li> </ol>
LECTURE CAPACITY	32
LAB CAPACITY	16
GRADED OR P/NP	Graded
EVALUATION	
DELIVERY METHOD	Lecture, Lab
ROOM REQUIREMENTS	Computer lab for lab
AUTHOR'S NOTES	



# VERMONT TECH

ELEMENT	CONTENT
DEPARTMENT	AGR
AUTHOR (S)	Roger L. Howes
COURSE NUMBER	<b>AGR 1061</b>
COURSE TITLE	<b>Burls to Boards</b>
SHORT TITLE	Burls to Boards
COURSE LEVEL	1000
SHARED VSC COURSE	No
DATE CREATED	
CHECKED/CHANGED	5/2017
PREREQUISITES	AGR 1011
	Prerequisite must be taken previously <input type="checkbox"/>
COREQUISITES	
	Corequisite must be taken concurrently <input type="checkbox"/>
RESTRICTIONS	
SPECIAL FEES	No
CREDITS	3
CROSS-LIST	
HOURS	2 hours of lecture, 3 hours of lab per week
SEMESTER	As required
COURSE DESCRIPTION	In this course, the student learns the principles of tree harvesting for wood product production. Choosing, cutting, skidding, and milling of common types of lumber in Vermont are discussed and practiced. Upon completion, the successful student can manage small woodlots for efficient personal production of lumber product.
SUGGESTED TEXTS	Handouts provided
OPTIONAL TEXTS	
COURSE OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Identify and safely harvest designated trees</li> <li>2. Oversee the appropriate primary and secondary transport of logs to the sawmill</li> <li>3. Saw logs into the materials requested by the customer or for greatest commercial value using appropriate techniques and procedures</li> <li>4. Scale and grade lumber</li> <li>5. Prepare lumber for appropriate drying technique or immediate transport</li> <li>6. Understand the marketing of lumber products</li> <li>7. Participate in a PowerPoint presentation before a public review board</li> </ol>
COURSE CONTENT	<ol style="list-style-type: none"> <li>1. Tree identification and defects</li> <li>2. Tree harvesting</li> <li>3. Primary and secondary transport</li> <li>4. Mill preparation and setup</li> <li>5. Sawing Techniques                             <ol style="list-style-type: none"> <li>a. Plain sawing</li> <li>b. Quarter sawing</li> <li>c. Timber frame sawing</li> </ol> </li> <li>6. Non-lumber products</li> <li>7. Scaling lumber</li> <li>8. Grading lumber</li> <li>9. Stacking lumber</li> <li>10. Drying lumber</li> <li>11. Marketing</li> <li>12. PowerPoint presentation</li> </ol>
LAB/STUDIO OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Identify local species of trees, harvest designated trees</li> <li>2. Oversee primary and secondary transportation of wood products</li> <li>3. Setup and safely saw lumber using appropriate techniques either for customer or greatest commercial value</li> <li>4. Scale and grade lumber</li> <li>5. Prepare lumber for air or kiln drying or immediate transport</li> <li>6. Understand marketing lumber products</li> <li>7. Make a public PowerPoint presentation</li> </ol>
LAB/STUDIO CONTENT	<ol style="list-style-type: none"> <li>1. Tree identification and defects</li> <li>2. Tree harvesting</li> <li>3. Primary and secondary transport</li> <li>4. Mill preparation and setup</li> <li>5. Sawing Techniques                             <ol style="list-style-type: none"> <li>a. Plain sawing</li> <li>b. Quarter sawing</li> </ol> </li> </ol>

# VERMONT TECH

	<ul style="list-style-type: none"> <li>c. Timber frame sawing</li> <li>6. Non-lumber products                             <ul style="list-style-type: none"> <li>a. Sawdust</li> <li>b. Bark</li> <li>c. Slabs</li> </ul> </li> <li>7. Scaling lumber</li> <li>8. Grading lumber</li> <li>9. Stacking lumber</li> <li>10. Drying lumber</li> <li>11. Marketing</li> <li>12. PowerPoint presentation</li> </ul>
LECTURE CAPACITY	32
LAB CAPACITY	6
GRADED OR P/NP	Graded
EVALUATION	Exams, projects, attendance, presentation
DELIVERY METHOD	Lecture, Lab
ROOM REQUIREMENTS	Farm lab for lab
AUTHOR'S NOTES	

# VERMONT TECH

ELEMENT	CONTENT
DEPARTMENT	BUS
AUTHOR (S)	G. Gregory Hughes
COURSE NUMBER	BUS 3230
COURSE TITLE	Principles of Financial Management
SHORT TITLE	Principles Fin Mngmnt
COURSE LEVEL	3000
SHARED VSC COURSE	Yes
DATE CREATED	
CHECKED/CHANGED	2/2017
PREREQUISITES	ACC 1020 or 2121
	Prerequisite must be taken previously <input type="checkbox"/>
COREQUISITES	
	Corequisite must be taken concurrently <input type="checkbox"/>
RESTRICTIONS	
SPECIAL FEES	Yes
CREDITS	3
CROSS-LIST	
HOURS	3 hours of lecture per week
SEMESTER	Fall
COURSE DESCRIPTION	This course teaches the student to use accounting data to make financial decisions. The student learns decision-making techniques and uses them to address financial situations faced by a firm.
SUGGESTED TEXTS	<i>Foundations of Financial Management</i> ; Block, Hirt, & Danielson
OPTIONAL TEXTS	
COURSE OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Demonstrate proficiency in developing and analyzing projected accounting reports including the income statement, balance sheet, and statement of cash flows</li> <li>2. Construct a ratio analysis which provides a meaningful comparison of a company to its industry and demonstrate how ratios can be used to measure profitability, asset utilization, liquidity, and debt utilization</li> <li>3. Research how operating and financial leverage can increase a firm's profit potential, but also increase its risk of failure</li> <li>4. Analyze the various sources of short-term financing including trade credit, bank loans, and commercial paper</li> <li>5. Analyze the time value of money including the computation of present values and future values for single amounts and annuities</li> <li>6. Demonstrate proficiency in the various capital budgeting decision techniques including the payback method, net present value, and the internal rate of return</li> </ol>
COURSE CONTENT	<ol style="list-style-type: none"> <li>1. The goals and activities of financial management</li> <li>2. Review of accounting</li> <li>3. Depreciation and income tax considerations</li> <li>4. Financial analysis</li> <li>5. Financial forecasting</li> <li>6. Constructing <i>pro forma</i> statements</li> <li>7. Operating and financial leverage</li> <li>8. Working capital management</li> <li>9. Cash management</li> <li>10. Sources of short term financing</li> <li>11. The time value of money</li> <li>12. The cost of capital</li> <li>13. The capital budgeting decision</li> <li>14. Risk and capital budgeting</li> </ol>
LAB/STUDIO OUTCOMES	
LAB/STUDIO CONTENT	
LECTURE CAPACITY	32
LAB CAPACITY	
GRADED OR P/NP	Graded
EVALUATION	Homework, tests, term project, participation
DELIVERY METHOD	LEC
ROOM REQUIREMENTS	White board
AUTHOR'S NOTES	





# VERMONT TECH

ELEMENT	CONTENT
DEPARTMENT	BUS
AUTHOR (S)	G. Gregory Hughes
COURSE NUMBER	<b>BUS 2210</b>
COURSE TITLE	<b>Small Business Management</b>
SHORT TITLE	Small Bus Mgmt
COURSE LEVEL	2000
SHARED VSC COURSE	Yes
DATE CREATED	
CHECKED/CHANGED	6/12/2017
PREREQUISITES	
	Prerequisite must be taken previously <input type="checkbox"/>
COREQUISITES	
	Corequisite must be taken concurrently <input type="checkbox"/>
RESTRICTIONS	
SPECIAL FEES	No
CREDITS	3
CROSS-LIST	
HOURS	3 hours of lecture per week
SEMESTER	Fall, Spring
COURSE DESCRIPTION	This course explores the practical aspects of organizing and managing a small business. The goal of the course is to equip the student with the knowledge necessary to make informed business decisions. The student examines how to analyze a business and improve its management. The course covers the basic concepts of accounting, finance, cash management, business law, government regulations, taxes, and marketing.
SUGGESTED TEXTS	<i>Entrepreneurship and Effective Small Business Management</i> ; Scarborough & Cornwall
OPTIONAL TEXTS	
COURSE OUTCOMES	<p>The successful student will be able to:</p> <ol style="list-style-type: none"> <li>1. Describe the advantages and disadvantages of owning a business</li> <li>2. Describe the characteristics of an entrepreneur</li> <li>3. Understand how to develop a strategic plan for a business</li> <li>4. Explain the importance of having a competitive advantage</li> <li>5. Discuss the issues that entrepreneurs should consider when evaluating different forms of ownership</li> <li>6. Describe the benefits and limitations of buying a franchise</li> <li>7. Describe the elements of a solid business plan</li> <li>8. Describe the components of a marketing plan and explain the benefits of preparing one</li> <li>9. Describe the marketing strategies on which a small business can build a competitive edge in the marketplace</li> <li>10. Explain practical methods for stretching an entrepreneur's advertising budget</li> <li>11. Explain why pricing is both an art and a science</li> <li>12. Describe how to prepare financial statements and use them to manage a small business</li> <li>13. Describe the fundamental principles involved in managing cash flow</li> <li>14. Describe the various sources of outside equity capital available to entrepreneurs</li> <li>15. Describe the various sources of debt capital and the advantages and disadvantages of each</li> </ol>
COURSE CONTENT	<ol style="list-style-type: none"> <li>1. Entrepreneurs</li> <li>2. Strategic management</li> <li>3. Choosing a form of ownership</li> <li>4. Franchising</li> <li>5. Buying an existing business</li> <li>6. Determining the value of a business</li> <li>7. Feasibility analysis and business plan</li> <li>8. Building a marketing plan</li> <li>9. Creative use of advertising &amp; promotion</li> <li>10. Pricing and credit strategies</li> <li>11. Creating a solid financial plan</li> <li>12. Managing cash flow</li> <li>13. Sources of equity financing</li> <li>14. Sources of debt financing</li> </ol>
LAB/STUDIO OUTCOMES	
LAB/STUDIO CONTENT	
LECTURE CAPACITY	32
LAB CAPACITY	
GRADED OR P/NP	Graded
EVALUATION	Tests, projects, participation
DELIVERY METHOD	LEC
ROOM REQUIREMENTS	

# VERMONT TECH

AUTHOR'S NOTES	
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# VERMONT TECH

ELEMENT	CONTENT
DEPARTMENT	AGR
AUTHOR (S)	Charles Dana
COURSE NUMBER	AGR 3040
COURSE TITLE	<b>Maple Production: Science &amp; Practice</b>
SHORT TITLE	Maple Production
COURSE LEVEL	3000
SHARED VSC COURSE	No
DATE CREATED	
CHECKED/CHANGED	5/2017
PREREQUISITES	BIO 1220; LAH 1050
	Prerequisite must be taken previously <input type="checkbox"/>
COREQUISITES	
	Corequisite must be taken concurrently <input type="checkbox"/>
RESTRICTIONS	
SPECIAL FEES	No
CREDITS	3
CROSS-LIST	
HOURS	2 hours of lecture, 2 hours of lab per week
SEMESTER	Spring
COURSE DESCRIPTION	This course presents current information relating to all aspects of maple production. Principles and practical application of sugarbush management; sap production; maple production facilities and equipment; maple syrup production; product packaging and marketing; and operator safety are covered.
SUGGESTED TEXTS	<i>Ohio State University Extension Bulletin 856 2006 OSU North American Maple Producers Manual</i>
OPTIONAL TEXTS	
COURSE OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Develop and implement a maple sugar operation plan</li> <li>2. Explain maple tree physiology and its effect on maple sap production</li> <li>3. Design, layout, manage, and assess maple production systems</li> <li>4. Produce, package, and assess maple products according to industry standards</li> <li>5. Develop and implement maple product marketing strategies</li> </ol>
COURSE CONTENT	<ol style="list-style-type: none"> <li>1. Introduction to maple production</li> <li>2. History of maple production</li> <li>3. Sap production and tree science</li> <li>4. Tree identification and forest management for maple production</li> <li>5. Maple sap production                             <ol style="list-style-type: none"> <li>a. Tapping</li> <li>b. Collection</li> <li>c. Storage</li> </ol> </li> <li>6. Making maple syrup</li> <li>7. Maple syrup grading, packaging, storage, and quality control</li> <li>8. Other maple products</li> <li>9. Marketing maple</li> <li>10. Sugaring economics</li> <li>11. Safety</li> </ol>
LAB/STUDIO OUTCOMES	The successful student will be able to demonstrate the practical applications of maple production
LAB/STUDIO CONTENT	<ol style="list-style-type: none"> <li>1. Pipeline design and installation</li> <li>2. Preparation of pipeline for tapping</li> <li>3. Tapping</li> <li>4. Boiling</li> <li>5. Finishing</li> <li>6. Value-added products</li> <li>7. Inventory</li> <li>8. Tool clean-up</li> <li>9. Season evaluation</li> </ol>
LECTURE CAPACITY	32
LAB CAPACITY	16
GRADED OR P/NP	Graded
EVALUATION	Quizzes, homework, lab participation, exams, final project
DELIVERY METHOD	Lecture, Lab
ROOM REQUIREMENTS	
AUTHOR'S NOTES	



# VERMONT TECH

ELEMENT	CONTENT
DEPARTMENT	AGR
AUTHOR (S)	Molly Willard
COURSE NUMBER	AGR 1801
COURSE TITLE	Forestry Internship
SHORT TITLE	Forestry Internship
COURSE LEVEL	1000
SHARED VSC COURSE	No
DATE CREATED	12/2015
CHECKED/CHANGED	5/24/2017
PREREQUISITES	
	Prerequisite must be taken previously <input type="checkbox"/>
COREQUISITES	
	Corequisite must be taken concurrently <input type="checkbox"/>
RESTRICTIONS	
SPECIAL FEES	No
CREDITS	3
CROSS-LIST	
HOURS	2 hours of lecture, 6 hours of internship per week
SEMESTER	As required
COURSE DESCRIPTION	Through this course, the student gains an understanding of the wood and timber industry. Based on interest, the student has the opportunity to work as an intern at a variety of wood-based industries. The experience could range from a lumber yard with scaling, a sawmill, a pellet business, a maple syrup operation, or a consulting or county forester.
SUGGESTED TEXTS	
OPTIONAL TEXTS	
COURSE OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Explain the value chain of the timber industry</li> <li>2. Look at the timber industry through a business owner's lens</li> <li>3. Implement skills based on their internship experience</li> <li>4. Work with people in the timber industry</li> <li>5. Recognize business opportunities and employment within the timber industry</li> </ol>
COURSE CONTENT	<ol style="list-style-type: none"> <li>1. Saw Mills</li> <li>2. Wood Pellets/ Fire Wood</li> <li>3. Hardwood vs Softwood Uses</li> <li>4. Current Use Plans</li> <li>5. Forestry Mapping</li> <li>6. Maple Bush Management</li> <li>7. Pruning and Grafting</li> <li>8. Timber Plantations</li> <li>9. Christmas Tree Production</li> <li>10. Value Added Products</li> <li>11. Cedar and Log Homes</li> </ol> <p>Hands-on wood industry experience varies with student interest and placement. The student will work closely with their instructor and summarize in writing and presentation their weekly industry activities. Each major segment of the forestry industry will be presented: estimating, log harvesting, milling, and forest management and the student will undertake day-to-day executive functions of each segment.</p>
LAB/STUDIO OUTCOMES	The successful student will be able to: <ol style="list-style-type: none"> <li>1. Demonstrate soft skills needed in the workforce</li> <li>2. Demonstrate an understanding of the timber value chain</li> <li>3. Understand types of businesses and employment opportunities in the timber industry</li> <li>4. Demonstrate specific skills pertinent to their internship area of study</li> </ol>
LAB/STUDIO CONTENT	Hands-on working experience in the specific wood industry profession. Student will spend 90 hours at the determined intern site.
LECTURE CAPACITY	32
LAB CAPACITY	16
GRADED OR P/NP	P/NP
EVALUATION	
DELIVERY METHOD	Lecture, Lab
ROOM REQUIREMENTS	
AUTHOR'S NOTES	



Budget 2.0

Parameters & Assumptions

Retention		70.0%
FTE/HC		70.0%
Aid %		5.0%
Tuition Rate	\$	13,512
Equipment Capitalization	\$	92,854
Equipment Life (yrs)		15
FY16 Cost Ratio (Instruction/All)		58%
B/E Instructional Margin		74%

	Year		
<u>Enrollment</u>	<u>1</u>	<u>2</u>	<u>3</u>
Entering Class	5	10	20
Total HC	5	13	27
FTE	3.5	9.1	18.9

Revenue

Tuition Rev	\$	47,292	\$	122,959	\$	255,377
Financial Aid	\$	(2,388)	\$	(6,208)	\$	(12,894)
<i>Net Rev</i>	\$	<b>44,904</b>	\$	<b>116,751</b>	\$	<b>242,482</b>

510A : Salaries & Wages

Director	\$	-	\$	-	\$	-
Faculty 1	\$	45,000	\$	46,463	\$	47,973
Faculty 2	\$	-	\$	-	\$	-

510B/520 : Benefits

Group Insurance	\$	17,500	\$	17,500	\$	17,500
Other benefits	\$	10,004	\$	10,329	\$	10,664

540A : Supplies & Other Services

53110 : Supplies	\$	1,000	\$	1,020	\$	1,040
53120 : Educational Supplies	\$	1,250	\$	1,275	\$	1,301
53130 : Copying	\$	200	\$	204	\$	208
53171 : Hazmat Items	\$	-	\$	-	\$	-
53210 : Memberships	\$	750	\$	765	\$	780
53220 : Subscriptions	\$	-	\$	-	\$	-
53230 : Hospitality/Meals	\$	-	\$	-	\$	-
53261 : General Advertising	\$	10,000	\$	10,200	\$	10,404
53310 : Telephone	\$	-	\$	-	\$	-
53320 : Postage/Shipping	\$	-	\$	-	\$	-
53560 : Repairs-Equipment	\$	10,000	\$	10,200	\$	10,404
53650 : Leases/Rents-Equipment	\$	-	\$	-	\$	-
53890 : Miscellaneous	\$	200	\$	204	\$	208
53945 : General Profession Services	\$	3,600	\$	3,672	\$	3,745

540B : Travel

54100 : General/Mileage Reimburse	\$	-	\$	-	\$	-
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540C : Equipment

55110 : Instructional/Sci	\$	6,190	\$	6,190	\$	6,190
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<i>Expenses</i>	\$	<b>105,694</b>	\$	<b>108,021</b>	\$	<b>110,418</b>
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<i>Program Revenue net of Expense</i>	\$	<b>(60,790)</b>	\$	<b>8,729</b>	\$	<b>132,064</b>
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<i>Contribution Margin</i>		<b>-58%</b>		<b>8%</b>		<b>120%</b>
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<i>Target Margin</i>		<b>74%</b>		<b>74%</b>		<b>74%</b>
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<i>Target Revenue net of Expenses</i>	\$	<b>77,717</b>	\$	<b>79,429</b>	\$	<b>81,191</b>
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<i>Target Revenue</i>	\$	<b>183,411</b>	\$	<b>187,450</b>	\$	<b>191,609</b>
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<i>Target Student HC</i>		<b>20</b>		<b>21</b>		<b>21</b>
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<i>Target Entering Class</i>		<b>12</b>		<b>12</b>		<b>13</b>
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**Part V: Enrollment, Marketing and Public Relations Considerations**

a. Projected enrollment for new program:

	Year One	Three Years Out
<b>Full-Time</b>	5	25
<b>Part-Time</b>		
<b>In-State</b>	5	15
<b>Out-of-State</b>	<u>1</u>	<u>3</u>

2. Describe how you arrived at these projections:

We already have 4 deposits for the Fall 2017, not including the 3 enrolled now. When we looked at CTE numbers, 10% of the total high school students already emerged in a forestry/natural resource focus would be around 30 students.

3. Describe the marketing strategies for the new program.

We will be marketing on-line, social media, Ag Institute contact mailers and directly with high school guidance counselors and tech center directors.

4. Competition:

a. In state and region

The following are existing programs:

University of Maine: Fort Kent

Paul Smiths- NY

University of New Hampshire, Thompson School

University of Maine, Orono

Paul Smith is the most similar educational pathway to what we are replicating. The tuition is 24,210.00 compared to 12,456.00 at VTC.

b. Web-based NA, this is a hands-on applicable science associate's degree.

5. How the program will impact enrollments in existing programs at the College:

For the entire program of 63 credits, only 15 of them are new courses. All the other courses already exist. Therefore, the program is putting more students in already existing courses. As mentioned earlier, the entire first year of courses can be taken at CCV or another VSC and/or on-line. It also gives Diversified Ag Students additional electives to incorporate into their

CTE Enrollment Numbers in VT Results Sheet

CHCC	Goss	Josh	igoss@chccvt.net	Ag/NR	Forestry/NR	Enrollment
CTE	Falby	Peter	pfalby@ccsuvt.org	Ag/NR	Natural Resources	35
CTE	Kittredge	Jason	jkittredge@ccsuvt.org	Ag/NR	NR/Agriscience	
CVCC	Garland	Amanda	agarlcvc@u61.net/solsecvcc@u61.net	Ag/NR	Natural Resources	11
GMTCC	Nottermann	Ben	bnottermann@gmtcc.net	Ag/NR	Forestry	
GMTCC	Rowley	Samuel	srowley@gmtcc.net	Ag/NR	Sust Ag/Food Sys	14
HACTC	Ostler	Tom	ostliert@hartfordschools.net	Ag/NR	NR	28
LI	Houghton	Bruce	bruce.houghton@lyndoninstitute.org	Ag/NR	Diversified Ag	Full
NCCC	Nijensohn	Samuel	samuel.nijensohn@ncsuvt.org	Ag/NR	Forestry	18
PAHCC	Bosworth	Janice	jbosworth@pahcc.org	Ag/NR	Sustainable Ag	21
PAHCC	Townsend	Aaron	atownsend@pahcc.org	Ag/NR	Forestry/Nat Res	
PAHCC	Werner	Cheryl	cwerner@pahcc.org	Ag/NR	Sustainable Ag	
RB	Doro	Joe	jdoro@rbctc.org	Ag/NR	Nat Res	
RTCC	Dragon	Matt	mdragon@orangesouthwest.org	Ag/NR	Ag Tech	18
RTCC	Karpak	Devon	dkarpak@orangesouthwest.org	Ag/NR	Environ Resource	
RVTC	Harmer	John	jharmer@rvtc.org	Ag/NR	Hort/NR	
RVTC	Sidd	Mitch	msidd@rvtc.org	Ag/NR	Industrial Trades	
Stafford	Raishart	Mark	mark.raishart@rcpsvt.org	Ag/NR	Forestry/NR	14
SU	Bakowski	Jessica	jbakowski@stjacademy.org	Ag/NR	Nat Res	6
SVDCD	Dence	David	ddence@svcdc.org	Ag/NR	Forestry/Heavy Equip	25
WRCC	Nelson	Errol	enelson@wsesu.org	Ag/NR	Forestry	
WRCC	Nuzzo	Diane	dnuzzo@wsesu.org	Ag/NR	Horticulture	
CHCC	Downes	Sarah	sdownes@chccvt.net	Ag/NR/Co-	Ag/Co-op	27
CTE	Siddens	Robert	rsiddens@ccsuvt.org	AgNR	NR Mechanics	
				Total		217

CTE Instructor/ Director Feedback:

Awesome. In a time where all the colleges around us are looking to end two year programs and only offer bachelor degrees, this is huge.

I truly believe if VTC could get a program off the ground at a reasonable price it would be very successful.

Please let me know if I can help.

My Best,

Dave Dence

Hi,

I am looking very forward to your new forestry degrees. I think that it will fly...for so many years we have sent plenty of students to either Paul Smiths of UNH!

Please keep me posted!

TO

degree. Forestry is very much a part of Vermont's working lands and the agricultural sector. This program strengthens the Diversified Ag Bachelor of Science Degree as it stands.

6. *How the program will impact enrollments in existing programs at other VSC colleges:* The entire first year of courses can be taken at VTC Williston, CCV or another VSC and/or on-line.

This allows for students to easily transfer into the program as well. The core course are only offered at VTC Randolph Center Campus.

7. *How the program will impact existing and/ or future external relations:*

- Increase relations within the forestry workforce and industry
- Increase relations with UVM with the 2 + 2 program
- Increase transferable pathways with CCV and VSC colleges.

rev. 7/21/2016

**Addendum:**

Program Initiative

Economic Importance of Vermont Forest Base Economy



FORESTRY ASSOCIATES

Kim Crowe, Molly Willard

[kcrowe@vtc.edu](mailto:kcrowe@vtc.edu); [Mwillard2@vtc.edu](mailto:Mwillard2@vtc.edu)

802 535 5315

**Program Name:** AAS Forestry/Natural Resource Management

**Department:** Agriculture

**Campus:** Randolph Center

**Description:** The program would expand upon the existing forestry certificate program, allowing students to further their education into an associate's degree and potentially further to a bachelors with the creation of a 2 plus 2 program with UVM.

**Aligns with Vermont Tech Goals:** This program will Increase participation of non-traditional students, Increase partnerships with a Vermont employers, Increase post-secondary education and increase training in Vermont high school students and women in STEM. The project aligns with Vermont Tech's Gen-Ed requirements A-R.

**Aligns with VSC Goals:** The program aligns with the following VSC goals:

- Furthering competence in communication, research and critical thinking
- Fostering creative problem-solving both individually and collaboratively
- Create engaged, effective and responsible citizens, Develops in others the joy and necessity of lifelong learning
- Develop appropriate workplace skills and an appreciation of work quality and ethics

**Does this program build on an area of Vermont Tech's academic strength?**

Yes,

This program would provide technical hands-on training, build an innovative flexible educational program and build on supporting the working lands of Vermont through an educational program.

**Does this program partner with a VSC college or department**

The program will partner with UVM, see course alignment attachment for possible two plus two program.

**Have you identified faculty to teach in this program?**

Yes, Roger Howes and Molly Willard have been covering the forestry courses through the certificate program. Most of the courses already exist and have faculty attached to them. We will be developing one new course, for fall 2017, which Molly Willard is qualified to teach. The syllabus will align with UVM's. See attached Dendrology syllabus.

**Who are existing providers offering similar programs in the market place and overall undergraduate enrollment for each?**

University of Maine: Fort Kent: 1327

Paul Smiths- NY: 892

University of New Hampshire, Thompson School: 12831

University of Maine, Orono: 9339



Paul Smith Tuition is 24,210.00 compared to 12,456.00 at VTC.

**Program type:** Ongoing and Associate's degree

**What are the equipment needs of the program, if any?**

Ipads w/GPS, Arcview software, cruising instruments. We have submitted two grants that will help pay for equipment listed plus additional machinery that would help with the course.

**Audience:** Undergraduate, continuing education and professional seeking forestry license credentials. The program will pull people regionally (but is heavily state based in collaboration with CTE sites) and be offered on campus with lecture and labs. It meets professional industry demands on forestry as of legislation passed in July 2016. UVM has 50 undergraduates in there forestry degree. The popularity of the program at UVM is not sufficient for needs of Vermont residents. We are hoping to span the gap. Of the 50 enrolled students at UVM less than 5% are from VT.

**Trends:** See attached document as well

**Table 1.  
 Gross State Output and GSP of Forest-based  
 Manufacturing & Recreation, Vermont, 2011**

Gross Output (direct)	millions of \$	jobs*
Forestry, logging & trucking	\$45	875
Wood products manufacturing	\$239	2,327
Furniture and related product manufacturing	\$171	1,600
Paper manufacturing	\$317	1,000
Wood energy	\$60	300
Christmas trees and maple syrup	\$29	534
Sub-total direct	\$861	6,636
Sub-total with multipliers	\$1,484	10,555
Forest Recreation	\$1,936	10,050
Total	\$3,420	20,605

GSP, Forest Products Manufacturing	\$266
GSP, All Manufacturing, Vermont	\$3,150
GSP, Total for Vermont	\$27,296

\*full-time equivalent jobs

*GSP - Gross State Product includes value added, which is equal to its gross output minus its intermediate purchases from domestic industries or from foreign sources.*

*Gross Output - Includes the total value of all products produced and shipped by all producers (essentially sales).*





What economic trends are influencing demand for programming?

Innovative markets for the wood industry are being explored as pulp mills and mills decline. The required license law passed in July 2016 will demand students interested in forestry management receive college education. Students will need a high school diploma to enroll.

What is the size of the corresponding occupational field and its growth potential?

See attached report as well.

The median annual wage for logging workers was \$36,210 in May 2015.  
The total number of jobs related to the forestry industry for 2011 was 20,605.  
The total number of forestry, logging and trucking position in VT for 2011 was 846.  
Given the global trends of the wood industry, yet Vermont's push for more local use of wood and value added models the growth potential is unknown.

To understand the return on investment for the student, please provide the earnings potential for the corresponding occupational field.

The median annual wage for logging workers was \$36,210 in May 2015.

Where did the concept for this program originate?

The Institute for Applied Agriculture and Food Systems, in collaboration with Forest Parks and Recreation, CTE programs, VTC CEWD and other forestry professionals

There has been increasing interest with the forestry certificate program, the first year with minimal marketing we had three students; there are 4 enrolled for the fall as of now; there were 10 students at the last open house interested in the program.. The students enrolled in the certificate now program are hoping to continue on here with an associate's degree option and potentially a BS with the partnership with UVM.





Vermont Secretary of State Jim Condos

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**Navigation:**    [» Home](#)   [» Professional Regulation](#)   [» List of Professions](#)   [» Foresters](#)

## Foresters

### Forester licensure became required by law on July 1, 2016.

The General Assembly has directed the Office of Professional Regulation (OPR) to implement a program licensing and regulating foresters. The purpose of licensure is to safeguard the public welfare by ensuring foresters practicing in Vermont meet established professional standards for training, education, experience, and competence. [Act 166](#), establishing forester licensure, took effect July 1, 2016.


As we implement the new law, OPR's goals are to educate and advise foresters and other affected parties, and then to facilitate licensure for eligible foresters in a manner that is simple and minimally disruptive.

For questions or to contact the board, email or call: [Kara Shangraw](#) | 802-828-5434

To better serve you, we have a list of our most frequently asked questions. *Please click on the button below to find the answer to your question before calling or emailing.*

This page was last updated: 2017-02-15





The  
ECONOMIC  
IMPORTANCE  
of  
VERMONT'S  
FOREST-BASED  
ECONOMY 20 13

North East State Foresters Association





# I. Introduction

The landscape of Vermont has experienced many changes during our history. One of the constants has been a working forest landscape that provides goods and services through stewardship, management, and conservation. Managing forests sustainably involves a recognition of the ecological, social, and economic systems necessary to maintain forest health while providing benefits for this and future generations.

The economic importance of Vermont's working forest has seen considerable attention of late. This recognition has seen a renaissance in the "Buy Local" movement extending from food to forests. From maplewood to lumber, biomass to fine furniture, carbon sequestration to clean water, our forests have value. Forest-based manufacturing and forest-related recreation and tourism are significant economic drivers for Vermont, resulting in a substantial contribution to our state's economy.

Vermont has a well-deserved reputation for its agricultural products, so it might come as a surprise that its land base is mostly forest. Vermont's forests cover 4,591,281 acres of land. That's 78% of the State, a level which has stayed steady since the 1980s. The northern hardwood mix of beech, birch, and maple dominates Vermont's forests, accounting for 71% of the forest cover.

Like most eastern states, Vermont has relatively little public land. The Green Mountain National Forest has two large blocks, and the state and municipalities own many parcels of forests and parks. Still, this accounts for only 19% of the forest. Individuals and families own more than 80% of the forest. Unlike other northeastern states with large corporate ownerships, only 1% of Vermont's forest is owned by businesses, including timberland investment management organizations (TIMOs) and Real Estate Investment Trusts (REITs).

Across the state, the volume of trees continues to increase and net growth exceeds the harvest annually, although that ratio is seeing a decline. Current inventories show that Vermont's forests add 2.4 million cords in growth per year while approximately 14 million cords of timber is harvested. To put that into perspective, Vermont's standing forest holds 80 million cords of timber, which includes all trees five inches in diameter or larger.

This report "The Economic Importance of Vermont's Forest-Based Economy" provides a brief overview of the value of one of Vermont's greatest assets, and I hope it will add to your understanding of Vermont's forest and its economic contribution to the state.

Thank you,  
Steven Sinclair  
Director of Forests  
Department of Forests, Parks & Recreation



Steven Sinclair

Acknowledgements: This publication was funded by the U.S. Endowment for Forestry and Communities through the Northern Forest Center and the Vermont Department of Forests, Parks and Recreation, with assistance from the Vermont Agency of Commerce, Vermont Woodlands Association, Vermont Wood Manufacturers Association, The New England Society of American Foresters, and the Plum Creek Foundation.







## II. Executive Summary

Timber harvests contribute tremendous value to all of the forest industry sectors in Vermont. Approximately 6,636 workers (full-time equivalents) are employed in the forest products, maple, and Christmas tree sectors, and their efforts generate over \$861 million in annual sales. Those numbers underestimate the true value, and an economic model known as IMPLAN provides multipliers that help take into account the rippling effect this industry has on the other parts of the economy. This model estimates that the forest products industry employs 10,555 people and has \$1.4 billion in economic output.

Most of the wood harvested in Vermont is processed within its borders, but Vermont is part of a larger regional economy within which wood flows freely. Figures from 2011 illustrate this flow. In that year for all products, 914,000 cords of wood were harvested and 860,000 cords were processed in Vermont; 379,000 cords left the state (mostly to Canada) and 324,000 cords were trucked into the state.

It's important to note that the economic output and number of jobs in the forest products sector have been reduced since it reached its peaks in the 1990s and early 2000s. This has mirrored similar trends in other manufacturing sectors in the U.S. as more and more manufacturing has moved to other parts of the world.

Vermont's Use Value Appraisal program reduces the property tax for more than 14,000 landowners of 18 million acres of forestland enrolled in the program. The program requires enrolled parcels to be actively managed, which means that approximately 39% of the private forest land base is periodically contributing to the forest-based economy.

One other side of the forest economy – the forest-based recreation economy – also plays an important role, contributing nearly as many jobs and generating even more revenue than the wood-based economy. Recreation provides 10,050 jobs and generates annual revenues of \$1.9 billion.

Table 1.  
Gross State Output and GSP of Forest-based Manufacturing & Recreation, Vermont, 2011

Gross Output (direct)	millions of \$	jobs*
Forestry, logging & trucking	\$45	875
Wood products manufacturing	\$239	2,327
Furniture and related product manufacturing	\$71	1,600
Paper manufacturing	\$37	1,000
Wood energy	\$60	300
Christmas trees and maple syrup	\$29	534
Sub-total direct	\$861	6,636
Sub-total with multipliers	\$1,484	10,555
Forest Recreation	\$1,936	10,050
<b>Total</b>	<b>\$3,420</b>	<b>20,605</b>

GSP, Forest Products Manufacturing	\$266
GSP, All Manufacturing, Vermont	\$3,150
GSP, Total for Vermont	\$27,296

\*full-time equivalent jobs

GSP – Gross State Product includes value added, which is equal to its gross output minus its intermediate purchases from domestic industries or from foreign sources.

Gross Output – Includes the total value of all products produced and shipped by all producers (essentially sales).

This report is an update of a series of similar reports that have been published for the State of Vermont by the North East State Foresters Association since the early 1990s. The goal is to capture the economic value of the forest-based economy of the State and provide analyses of trends for key economic indicators. The sectors covered in this report include forestry and logging, related trucking, wood products manufacturing, wood furniture and related products manufacturing, pulp and paper manufacturing, wood energy, and the forest-based recreational economy that includes camping, hiking, hunting, downhill skiing, cross-country skiing, snowmobiling, fall foliage viewing, and wildlife viewing. Additional discussions in this report, compared to past reports, include use of economic multipliers to give a truer picture of the forest-based economy, carbon content of the forests of Vermont and the relationship of ecosystem services to the forest-based economy.

Data for this report come from federal, state and private sources. For a full list of sources, please see the end of this report.

We would like to thank the many people who assisted with the development of this report including Steven Sinclair, Ginger Anderson, Robert DeGeus and Paul Frederick of the Vermont Division of Forests at the Department of Forests, Parks and Recreation, and Steve Long.





### III. Forest-Based Economy – current status and trends

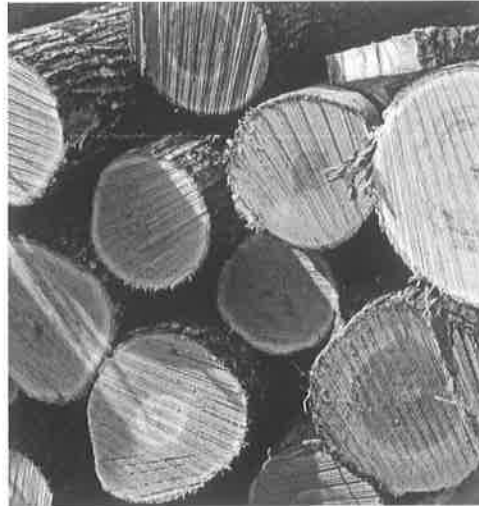
The forest has provided products to sell for as long as there has been a Vermont. The forest-based economy includes all of the activities that go into harvesting forest products and turning them into usable products. It starts with the foresters, loggers, and truckers who manage, harvest, and transport the raw material from the forest to various markets for processing. Primary products include solid wood products from sawmills, veneer mills, and mills that reconstitute wood chips into oriented strand board or particle board. Secondary manufacturers then use these primary products to make finished goods such as furniture, moldings, and turned wood products. There are no longer any wood pulp mills in Vermont, but several manufacturers make paper from pulp purchased from out of state.

Some of the raw wood is turned into fuel. Many homeowners heat their homes with firewood or wood pellets. Vermont is a leader in heating schools and institutional facilities with wood chips. Wood chips are the fuel for two large wood-fired power plants, as well as a number of smaller commercial and public facilities that use woody biomass to create heat and/or electricity.

For the last century, Vermont's forests have also made it a recreational destination, which has contributed much to the economy. Forest-based recreation has become a large part of the economy that continues to grow. Thousands of people visit Vermont's forests for camping, hiking, hunting, downhill skiing, cross-

country skiing, snowmobiling, wildlife viewing, and fall foliage viewing.

It must be noted that some of the data included in the next sections are from 2012 but most are from 2011. Activity and output in the forest products manufacturing sector has seen a significant upturn in 2013 as the country comes out of the recession. The data below does not show this.



#### ECONOMIC MULTIPLIERS

The data used for economic output and jobs in this report are for direct jobs and output. All sectors of the economy have connections to other parts of the economy that are not recognized in direct jobs and output numbers. To better represent the effect of a sector on the economy, economists often apply economic multiplier formulas. In the past reports like this from North East State Foresters Association (NEFA), economic multipliers have not been used for the forest products industry. That contrasts with the way the forest recreation jobs and economic value have been reported in the past, by using an industry standard with a multiplier-like approach to quantify the effect that the recreation economy has on Vermont.

The economic multiplier formula known as IMPLAN was created with the forest products industry in mind, so we have used it here. Using IMPLAN, the pre-multiplier annual value to the economy of \$861 million is valued at over \$1484 billion. Similarly, the 6,636 forest products economy jobs are estimated with multipliers to be 10,555 jobs.





## Forestry, logging, and trucking

The forestry, logging, and primary trucking sectors work together to get the raw materials – logs, pulpwood, firewood, or chips – from the forest to the primary manufacturing market. The combined employment for these woods workers is estimated at 875 jobs, which is down from a high of over 900 in 2002 and 2008. Payroll for forestry and logging in Vermont exceeds \$34 million annually (Figure 2) and has trended upward since 2009.

The annual economic activity for forestry trucking, calculated in terms of annual sales or value of shipments, exceeds \$45 million (Figure 3).

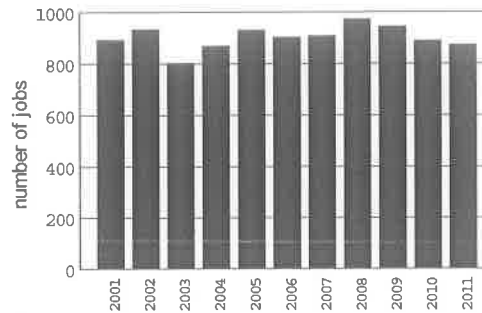
Vermont's logging infrastructure is changing. A study completed by the University of Maine in 2012<sup>1</sup> covering the Northern Forest states had sobering findings. The survey of logging business owners in Maine, New Hampshire, Vermont and New York determined that:

- 68% of the owners of logging businesses in Vermont are over 50 years old. Of those, 23% are older than 60.
- 63% of those surveyed have been in the business for longer than 30 years.
- 60% of Vermont logging businesses are owner operated with no employees. Less than 10% of Vermont logging businesses have more than 5 employees.
- Only 12% of Vermont logging businesses are incorporated. 68% are structured as owner operated or sole proprietorships.
- 71% of the logging companies operate conventional tree-length systems with chainsaws and skidders. At the same time, 66% of the harvesting volume is produced by mechanized companies using cut-to-length or whole-tree-harvesting (with chipping) systems.

This study points to a logging business sector that is old and getting older. In terms of output and employment, it is dominated by a small but growing number of businesses using the latest and most expensive harvesting equipment in order to have the highest production possible.

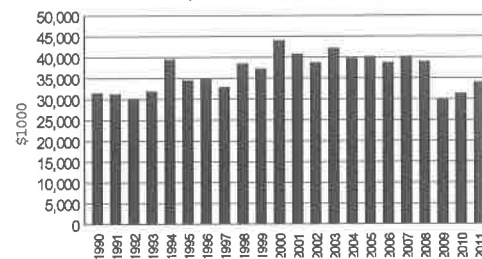
<sup>1</sup> A Survey of Business Attributes, Harvest Capacity and Equipment Infrastructure of Logging Businesses in the Northern Forest, Jeffrey G. Benjamin & Bennet H. Leon, University of Maine, 2012

Figure 1  
Vermont forestry, logging & trucking jobs



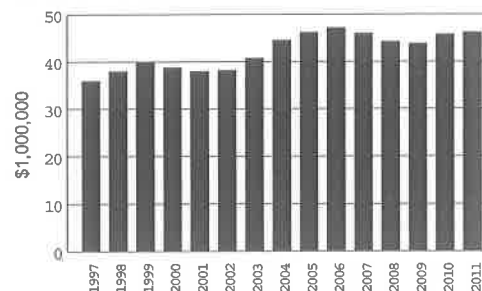
Source: U.S. Census Bureau – Census of Manufactures 2013 & industry estimates

Figure 2  
Vermont forestry and logging payroll



Source: U.S. Census Bureau – Census of Manufactures 2013

Figure 3  
Forest products truck transport annual sales in Vermont



Source: U.S. Census Bureau – Census of Manufactures 2013 and trucking industry non-published data



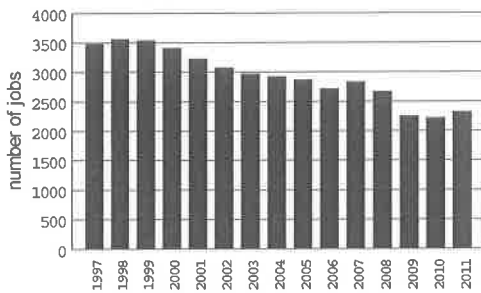


## Primary manufacturing

The raw wood products with the highest value are sawlogs and veneer logs, which are manufactured into lumber and veneer. These primary manufacturers employ 2,327 workers. Employment has decreased from a high of approximately 3,500 in the year 1999, but data show that worker productivity has increased. In 2011 it took about 80% of the number of workers to produce the same value of wood products as in 1997. Payroll in the wood products sector is approximately \$67 million annually. It peaked in 2000 at \$91 million, and after a sharp drop in 2009, it has been increasing again.

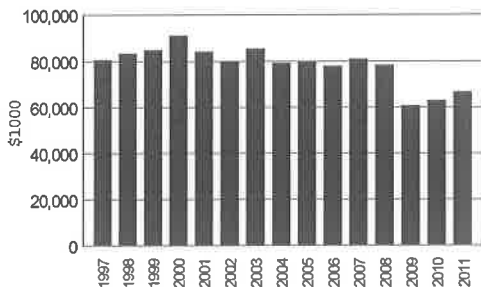
The peak of annual economic output, in terms of annual sales or value of shipments, was \$426 million in 2005. Today it stands at \$239 million but is holding steady.

Figure 4  
Vermont wood products manufacturing jobs



U.S. Dept. of Commerce – Bureau of Economic Analysis

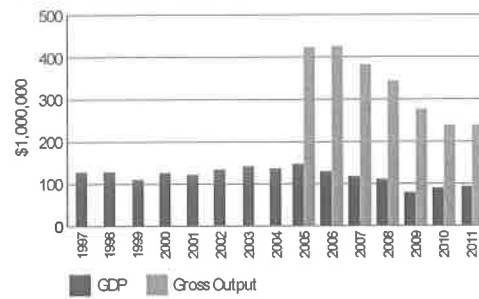
Figure 5  
Vermont wood products manufacturing payroll



U.S. Dept. of Commerce – Bureau of Economic Analysis

2. Worker productivity analysis based on value of product rather than volume is complicated by the fact that prices per unit of product tend to rise with inflation over time.

Figure 6  
Vermont wood products manufacturing output

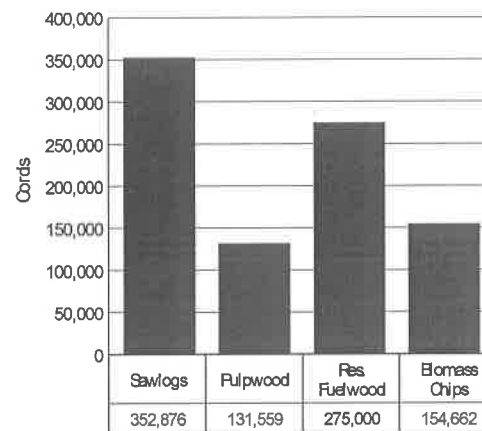


U.S. Dept. of Commerce – Bureau of Economic Analysis & Census of Manufactures

GDP – Gross Domestic Product includes value added, which is equal to its gross output minus its intermediate purchases from domestic industries or from foreign sources.

Gross Output – Includes the total value of all products produced and shipped by all producers (essentially sales).

Figure 7  
Vermont timber harvest 2011



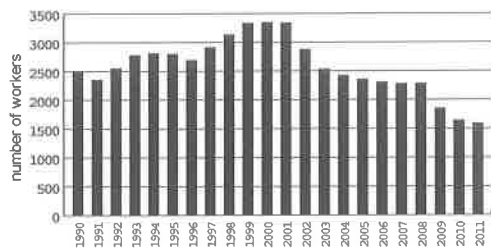




## Secondary manufacturing (furniture and related)

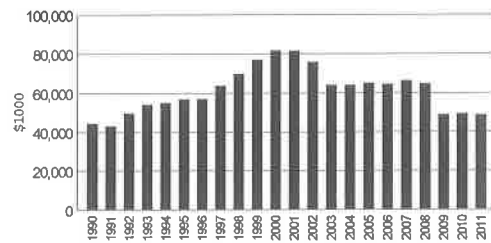
Secondary manufacturers transform lumber and other primary solid products into finished consumer products or parts for them. The making of furniture, moldings, turnings, and similar products employs nearly 1600 Vermont workers, which is down from a high of approximately 3,350 in 2000. As in other sectors, worker productivity has increased rapidly over the last 20 years. In 2011, it required only 75% of the workers to produce a unit of value as it did in 1990. The payroll in this sector is approximately \$49 million annually. It has decreased from a high of \$82 million in 2000 but has been steady in the last several years. Annual economic output, in the form of sales or value of shipments for the secondary wood products sector, is approximately \$143 million in Vermont.

Figure 8  
Number of workers in secondary wood products manufacturing jobs in Vermont



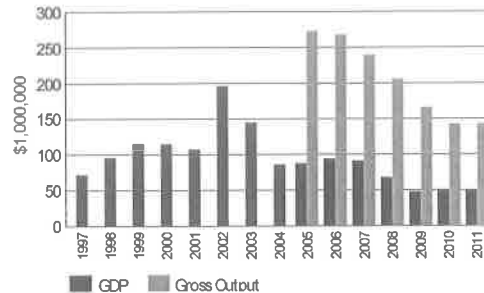
U.S. Dept. of Commerce – Bureau of Economic Analysis

Figure 9  
Secondary wood products manufacturing payroll in Vermont



U.S. Dept. of Commerce – Bureau of Economic Analysis & Vermont Department of Labor

Figure 10  
Vermont secondary wood products manufacturing output

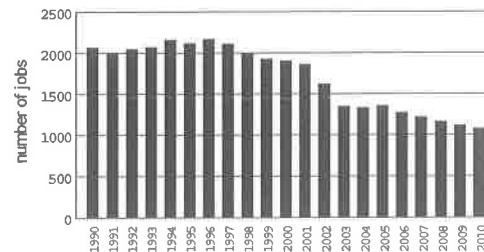


U.S. Dept. of Commerce – Bureau of Economic Analysis & Census of Manufactures

## Pulp and paper

The pulp and paper industry has two separate components. Pulp manufacturers produce pulp from wood fiber, and paper makers process that pulp into paper. Traditionally, these two activities take place in the same facility. That's no longer true in Vermont, where there are no pulp mills operating. Two large and several smaller specialty paper manufacturers remain in Vermont<sup>3</sup>. These facilities employ over 1000 workers, down from approximately 2,200 in 1996. Worker productivity in paper manufacturing has also increased over the last 20 years though not quite as much as in the wood products sector. Payroll in the paper sector is approximately \$63 million annually, down from its high of \$76 million in 2000. The annual economic output, in the form of sales or value of shipments for the pulp and paper sector, is approximately \$37 million in Vermont.

Figure 11  
Vermont paper manufacturing jobs



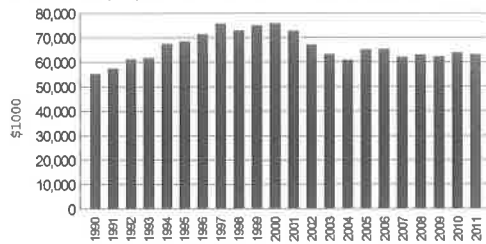
U.S. Dept. of Commerce – Bureau of Economic Analysis

3. While there are no pulp mills in Vermont, the logging infrastructure annually still harvests nearly 50,000 cords of pulpwood for pulp mills in New York and Maine.



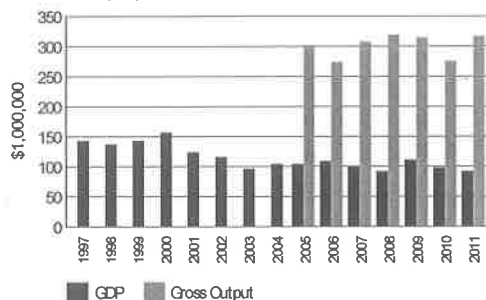


Figure 12  
Vermont paper manufacturing payroll



U.S. Dept. of Commerce – Bureau of Economic Analysis & Vermont Department of Labor

Figure 13  
Vermont paper manufacturing output



U.S. Dept. of Commerce – Bureau of Economic Analysis & Census of Manufactures



## Wood energy

While the last decade has seen increased national attention to wood energy, Vermont has a long history of using wood for heating and for electric energy generation. Many Vermont homes use cordwood as a primary or supplemental form of heating. Thousands of others heat with wood pellets. More than 75 commercial facilities use wood chips or pellets for heating, and the number is increasing rapidly. Wood-chip boilers heating schools and municipal buildings have become common. The state's two largest purchasers of energy wood are utility-scale biomass plants generating electricity.

Combined, these uses require approximately 18 million green tons of wood annually. The majority of this comes as part of normal timber harvesting operations that are also removing trees destined for other markets. That's because wood for energy (biomass) is worth much less than sawlogs, making it unattractive for landowners to harvest only biomass. A typical forest owner in the northeastern U.S. receives only \$.50 to \$2 per ton for biomass chips, and loggers typically cannot survive on harvesting biomass chips alone. A logging company most often harvests a full suite of products – sawlogs, pulpwood, firewood, and biomass chips – allowing them to cover their costs and make a profit on the overall harvest.

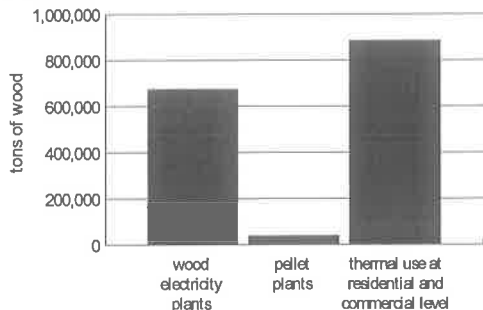
Despite its low market value, the harvest of biomass has broader benefits. Cutting poorer-quality trees gives landowners and land managers options and opportunities for practicing good forestry. Unlike oil, propane, and natural gas, biomass comes from local sources and benefits the local economy through jobs in the harvesting, processing, and use of wood. It is a cost-competitive fuel, and homeowners who make the investment to switch from fuel oil to wood pellets can save considerably on their annual heating fuel bill. There are an estimated 300 direct jobs in the wood energy sector beyond the timber harvesting and trucking sectors that are counted in another section of this report.

Most of the energy wood harvested in Vermont stays in Vermont or in the immediate region. Its low value makes it cost prohibitive to ship very far from where it is harvested. Some wood pellet mills in the southern U.S. are exporting pellets to Europe, but Vermont's mill is not. The local demand for Vermont-produced wood pellets continues to be strong, and Vermont's one wood pellet manufacturing plant consumes an estimated 40,000 green tons of feedstock raw material.



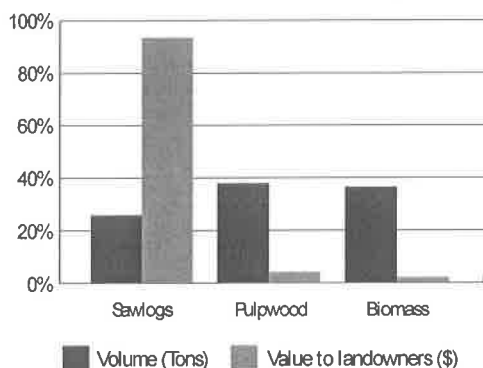


Figure 14  
Annual wood energy use by sector in Vermont



Source: Vermont Department of Forests, Parks and Recreation and Innovative Natural Resource Solutions LLC

Figure 15  
Typical volume vs. value of timber harvested in the Northern Forest region



Source: From typical harvest volumes and values in Maine, New Hampshire, Vermont and New York – state data

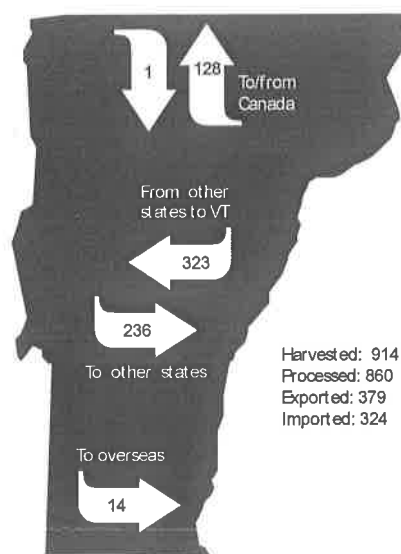


### Wood Flows and harvest trends

Not all the timber harvested in Vermont stays here to be processed in Vermont. Likewise, not all of the wood processed in the state is harvested in Vermont. Wood flows freely in the regional economy. Under the interstate commerce laws, states cannot regulate the flow of wood products among states or to and from Canada. Logs routinely travel across state lines and the international border according to proximity to markets, business relationships, and logistics of trucking routes. Figure 16 shows the flows of wood in and out of Vermont.

This report's forest products trend data clearly shows a smaller, more efficient forest products industry compared to 15 or 20 years ago. Other manufacturing sectors in the U.S. economy have undergone similar changes during this period. The volume of timber harvested from Vermont's forest has dropped from 14 million cords in 1997 to just under 1 million cords in 2011. The latter year was the tail end of the recession period, and the harvest is expected to continue its gradual rebound. (Figure 18). Despite the long-term contraction, the harvesting of wood products continues to play a significant role in the state's economy.

Figure 16  
Wood Flows to and from Vermont  
– in 1000 cords

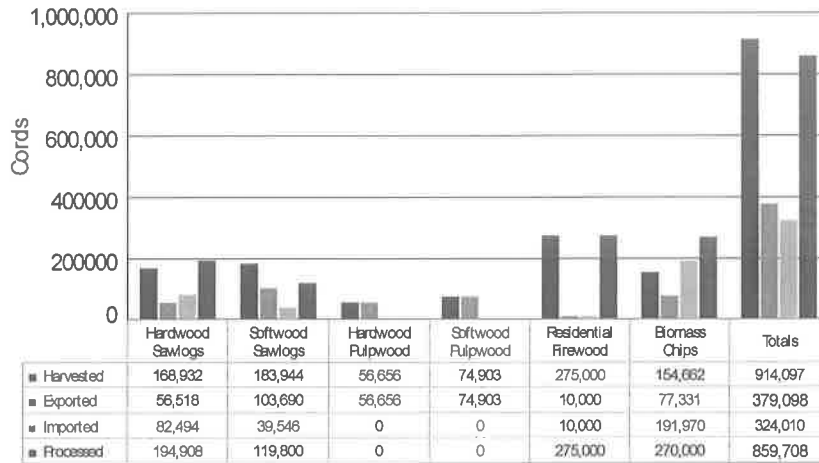


Source: Vermont Department of Forests, Parks and Recreation 2011, Innovative Natural Resource Solutions LLC



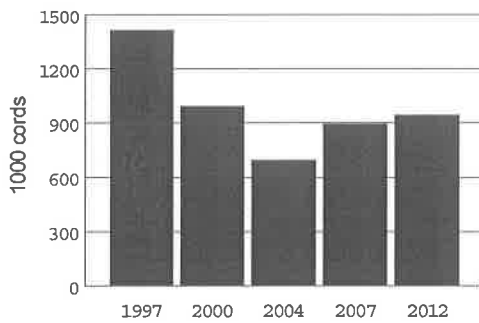


Figure 17  
Wood Flows in Vermont, 2011



Source: Vermont Department of Forests, Parks and Recreation, Innovative Natural Resource Solutions LLC

Figure 18  
Vermont timber harvest levels



### Forest-based recreation/tourism

As we noted earlier, forests dominate Vermont's landscape, so a large percentage of recreation and tourism activities are vitally linked to the forest. The extent of that link and the specific contribution by the forest environment to recreation and tourism expenditures can be difficult to quantify. Some activities take place primarily in the forest environment, including camping, hiking, hunting, downhill skiing, cross-country skiing, snowmobiling, and wildlife viewing. In our analysis, we assume that 75% of the value of these activities is directly attributable to the forests of Vermont. For fall foliage viewing, we assume a percentage of 100%. The approach used to assign values<sup>4</sup> to forest recreation is similar to the multipliers we have used above in reporting the forest industry values. In this way, in making comparisons between the forest products sector and the forest recreation sectors, we are comparing analogous data.

4. The key data source for the economic value of forest recreation in past NEFA publications like this one has been National Survey on Recreation and the Environment from the USDA Forest Service. While this source is used again, additionally we have used results from the new National Survey of Fishing, Hunting, and Wildlife-Associated Recreation conducted most recently in 2011 by the U.S. Fish and Wildlife Service of the federal Department of Interior. Because of this new data source, numbers in this report are not directly comparable to past reports for recreation and so trend data is not shown.

### Christmas trees and maple syrup

The Christmas tree and maple syrup industries do not have the complex multi-layered infrastructures of the wood products sector, but their importance to the local economy should not be underestimated. Vermont is the leading producer of maple syrup in the U.S. In 2012, the wholesale and retail sale of maple syrup and related products totaled over \$26 million while Christmas tree sales were \$2.8 million. There are more than 500 full-time equivalent jobs in the maple and Christmas tree sectors in Vermont. These are considered more of an agricultural crop, and you can find more information on them at the Vermont Agency of Agriculture, Food and Markets.



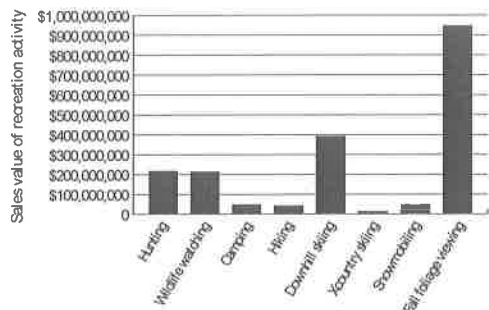




The forest-based recreational activities listed above contribute \$1.9 billion in sales annually to the Vermont economy. These include purchases at food and beverage stores, service stations, lodging places, eating and drinking establishments, and a host of other retail trade or service sectors. Fall foliage viewing is the largest contributor with 48% of the total sales, and is followed (in order) by downhill skiing, hunting, wildlife watching, camping, snowmobiling, hiking and cross-country skiing.

More than 10,000 people are employed in forest-based recreation and tourism sectors and payrolls reach \$158 million annually. We aren't reporting trend data here because we are using new data sources that are not directly comparable to past reports. We can say that the recreation economy in Vermont has not changed significantly since 2007 despite the ups and downs of the overall economy.

Figure 19  
Economic value of Forest-based Recreation in Vermont, 2011



Sources: Multiple sources including National Survey on Recreation and the Environment from the USDA Forest Service and National Survey of Fishing, Hunting, and Wildlife-Associated Recreation

Figure 20  
Jobs and Annual Payroll – Vermont forest recreation economy

Jobs	Payroll
10,050	\$157,755,557





## Value of ecosystem services

In a publication designed to show the value of the forest-related economy, the data includes only those aspects that can be measured and assigned a monetary value. Other goods and services from Vermont's forests are not so readily quantified, especially the natural assets called ecosystem services. The forest is an ecological life-support system that provides a full suite of services that are vital to human health and livelihood. Forests provide wildlife habitat and biological diversity, clean air, clean water, scenic landscapes, and carbon storage. These all have tremendous value to society, but carbon storage is the only service that people are currently placing a monetary value on.

Carbon in forests (specifically a tree's ability to sequester carbon from carbon dioxide in the air through photosynthesis) is now generating income for some forest owners through the California greenhouse gas regulatory process. Prices in this infant market can fluctuate wildly but in 2013 they ranged from \$10 to \$12 per ton of carbon sequestered. How much carbon can an acre of forest store? A rough average is between 0.5 ton and 15 tons of carbon per acre per year, depending on factors including the age, forest type, and stocking of the forest. This modest payment may be the start of converting valuable ecosystem services to an economic form humans understand best – money in a marketplace. Regardless, ecosystem services not yet monetized should be considered a valuable part of the forest-based economy in Vermont.

## VERMONT DIVISION OF FORESTS

The Vermont Division of Forests within the Department of Forests, Parks and Recreation has the following mission:

"The Forestry Division will lead the state in fostering a land ethic that recognizes our responsibility to manage for and promote healthy forests and is founded upon the principles of respect for the land, sustainable use and exemplary management. This ethic is the foundation which guides all of our decisions and actions."

You can reach the Vermont Division of Forests at 802-828-5310 or at [www.vtfor.org/html/forestry.cfm](http://www.vtfor.org/html/forestry.cfm)





## Position of forest-based economy in the overall economy

The forest-based economy continues to play a significant role in the overall economy of Vermont. The annual value of the forest-based economy including forest recreation is \$3.42 billion.

Many landowners participate directly in that economy by harvesting wood from their land. A significant portion of those landowners have been introduced to forest stewardship through Vermont's Use Value Appraisal program. This program reduces the property tax for more than 14,000 landowners of 18 million acres of forestland enrolled in the program. The program requires enrolled parcels to be actively managed, which means that approximately 39% of the private forest land base is periodically contributing to the forest-based economy.

Gross State Product (the state's version of Gross Domestic Product) for all of Vermont's Forest Products Manufacturing is \$266 million while the GSP of all Manufacturing is \$3.5 billion, so the forest sector represents 8% of the state's manufacturing value.

Table 1:  
 Gross State Output and GSP of Forest-based Manufacturing & Recreation, Vermont, 2011

Gross Output (direct)	millions of \$	jobs*
Forestry, logging & trucking	\$45	875
Wood products manufacturing	\$239	2,327
Furniture and related product manufacturing	\$171	1600
Paper manufacturing	\$317	1000
Wood energy	\$60	300
Christmas trees and maple syrup	\$29	534
Sub-total direct	\$861	6,636
Sub-total with multipliers	\$1484	10,555
Forest Recreation	\$1936	10,050
Total	\$3,420	20,605

GSP, Forest Products Manufacturing	\$266
GSP, All Manufacturing, Vermont	\$3,500
GSP, Total for Vermont	\$27,296

\*full-time equivalent jobs

GSP – Gross State Product includes value added, which is equal to its gross output minus its intermediate purchases from domestic industries or from foreign sources.

Gross Output – Includes the total value of all products produced and shipped by all producers (essentially sales).





## Issues with potential to affect Vermont's future forest economy

- **Land removed from active management** – If significant acreages of forestland are removed from the working forest, those acres may still provide the backdrop for the forest recreation/tourism part of the economy but will no longer also provide the raw material for the forest products manufacturing sectors of the economy.
- **Climate change** – In the short-term, given all other things being equal, slightly longer growing seasons resulting from shortened winters and slightly warmer temperatures may increase the growth of Vermont's trees. Slightly longer warm weather periods each year may increase recreation in the woods, but shortened winters may have negative effects on that portion of the recreation economy. Should climate change also result in increased forest pest problems and reduce overall annual rainfall (or result in other harmful changes), any perceived benefits could be offset. Over the long term, any positive effects from climate change could disappear if temperature increases and climate changes do not modify over time.
- **Loss of markets** – For the forest products sector from the woods to the mill, robust market opportunities are extremely important. The trend data in this report depicts a smaller overall forest products manufacturing industry than 20 years ago and suggests continued contraction. A positive sign is that the industry is producing more per worker than ever before.
- **Reduced federal and state support for forestry assistance programs** – Certain forest activities have been subsidized by the federal government in the form of cost-share payments. It is expected, in these times of reducing federal budgets in discretionary spending, that cost-share opportunities will dwindle, resulting in less forest improvement work on the ground for that subset of the forest owner population that has taken advantage of the cost-share opportunities.
- **Federal and state tax and other policies** – Business owners in the forest products and forest recreation sectors in Vermont have long said that stable public policies are important for business. However well-meaning, changing policies affecting property taxes, environmental regulations, fuel, inheritance tax, and workers comp, for instance, make for a challenging business environment.
- **Cost of travel** – A large portion of the forest-based recreation economy in Vermont is based on individuals traveling from other locations to visit Vermont and enjoy its beauty. The price of transportation fuels influences whether tourists decide to travel to Vermont. As fuel costs increase, fewer out of state tourists will visit the forests of Vermont. On the other hand, an upward trend in fuel costs can also result in more Vermonters choosing to stay for local recreation.







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## North East State Foresters Association (NEFA)

### NEFA'S Mission

The North East State Foresters Association (NEFA) is the State Foresters of Vermont, New Hampshire, Vermont, and New York cooperating with the US Forest Service State & Private Forestry on issues of common interest (see [www.nefainfo.org](http://www.nefainfo.org)).

This booklet is part of a series on the economic importance and value of forest-based manufacturing and forest-related recreation and tourism of the four states in the NEFA region. Past reports can be viewed at [www.nefainfo.org](http://www.nefainfo.org).

This publication was funded by the U.S. Endowment for Forestry and Communities through the Northern Forest Center and the Vermont Department of Forests, Parks and Recreation, with assistance from the Vermont Agency of Commerce, Vermont Woodlands Association, Vermont Wood Manufacturers Association, The New England Society of American Foresters, and the Plum Creek Foundation.



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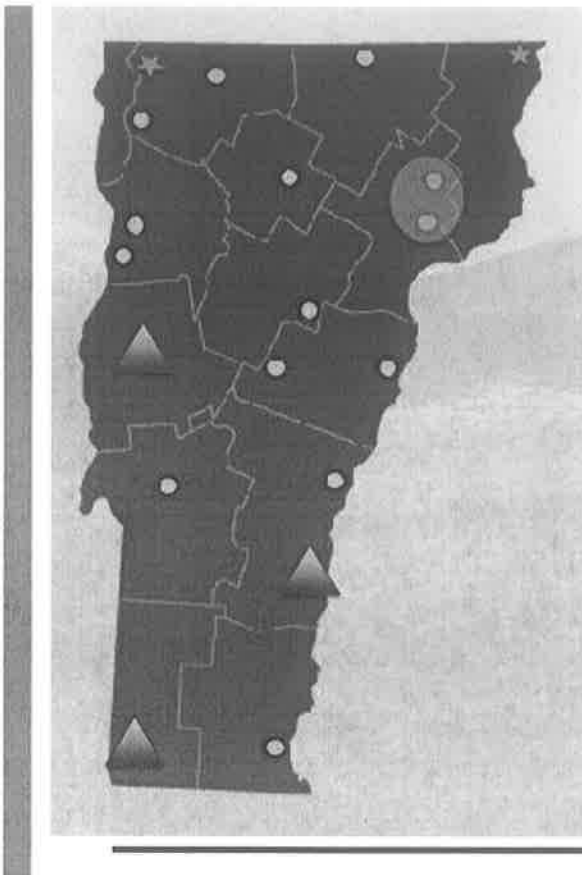
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Supporting Figures and Tables



## Diverse Governance Statewide

- ▲ Independent Technical Center Districts
- ★ Satellite location/comprehensive high school
- Independent Schools hosting technical education programs
- Full or part-time regional career centers



**Table 1.**  
**Gross State Output and GSP of Forest-based Manufacturing & Recreation, Vermont, 2011**

Gross Output (direct)	millions of \$	jobs*
Forestry, logging & trucking	\$45	875
Wood products manufacturing	\$239	2,327
Furniture and related product manufacturing	\$171	1,600
Paper manufacturing	\$317	1,000
Wood energy	\$60	300
Christmas trees and maple syrup	\$29	534
Sub-total direct	\$861	6,636
Sub-total with multipliers	\$1,484	10,555
Forest Recreation	\$1,936	10,050
Total	\$3,420	20,605

GSP, Forest Products Manufacturing	\$266
GSP, All Manufacturing, Vermont	\$3,150
GSP, Total for Vermont	\$27,296

\*full-time equivalent jobs

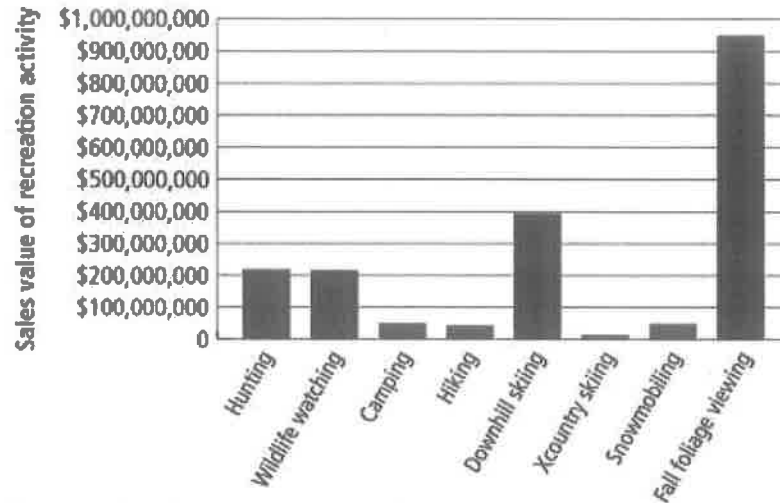
*GSP – Gross State Product includes value added, which is equal to its gross output minus its intermediate purchases from domestic industries or from foreign sources.*

*Gross Output – Includes the total value of all products produced and shipped by all producers (essentially sales).*





**Figure 19**  
**Economic value of Forest-based Recreation**  
**in Vermont, 2011**



*Sources: Multiple sources including National Survey on Recreation and the Environment from the USDA Forest Service and National Survey of Fishing, Hunting, and Wildlife-Associated Recreation*

**Figure 20**  
**Jobs and Annual Payroll - Vermont forest**  
**recreation economy**

Jobs	Payroll
10,050	\$157,755,557



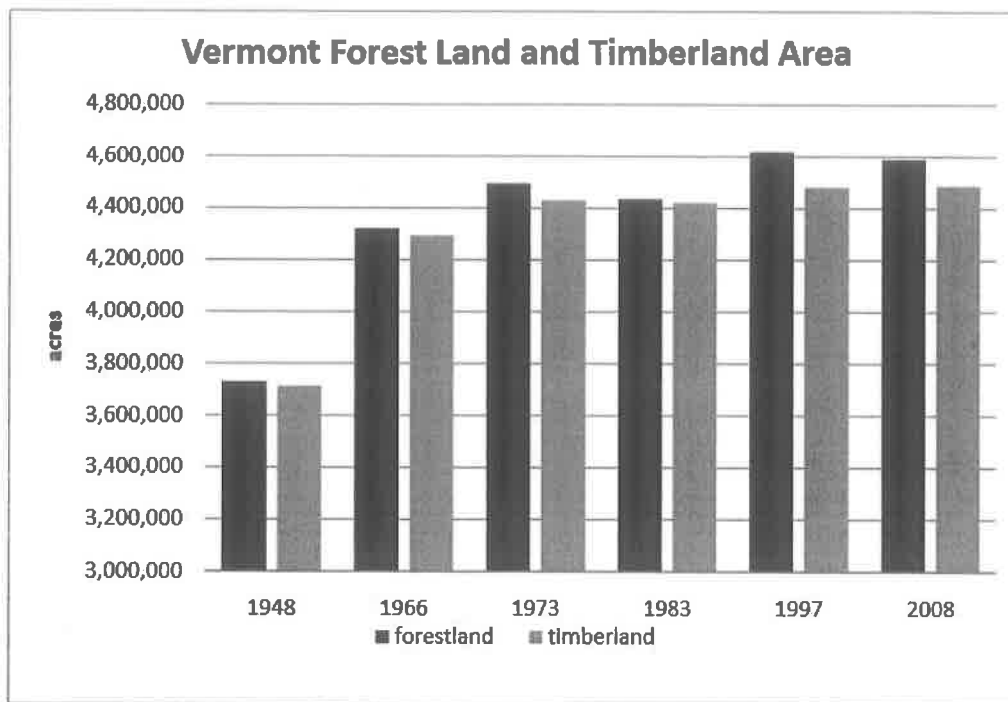


Figure 1: Vermont Forest Land and Timberland. Source: National Forest Inventory and Analysis Database, 2008



Item 3:

Policy 101 “PreCIP”

- a. Council of Presidents Recommendations for 2017
- b. Review Committee Reports
- c. Resolution: Commendation of Committees on  
2017 Process
- d. Approval of Programs and Process for 2018  
Review

TO: Education, Personnel, and Student Life Committee  
FROM: Council of Presidents, Chancellor Spaulding  
RE: Review of PreCIP Review Committee Reports  
DATE: December 1, 2017

Per VSC Policy 101, Program Review and Continuous Improvement Process (PreCIP), the academic programs listed in the attached reports have all completed a nearly eighteen-month review. This process began in May 2016 with a VSC-wide professional development retreat for faculty contributors to self-study reports, continued through the 2016-2017 academic year with individual program analysis activities and deans' interviews of graduating students, and culminated in review committee meetings and findings this fall.

The specific program improvement recommendations that emerged from the committee reports are primarily of direct use at our individual institutions, and we shall consider these in our ongoing institutional prioritization of improvement efforts. Across the reports, there also emerged recommendations and future directions for the system. Below we present our summary review and recommendations from this year's process.

Overview:

Programs in this year's review cycle included computer information systems and software engineering; agriculture, horticulture, and equine studies; biology; environmental and ecological sciences and STEM studies; geology; and outdoor education, sports administration, and mountain recreation management. Common themes across many of these programs included attention to gender balance; the need for recruitment and support strategies to target students who may initially struggle or not consider STEM-focused degrees and career options; and the need for robust employer and field-based partnerships to maintain program currency and expand student internship and employment opportunities. Engagement in review committee meetings was consistently high, with faculty expressing appreciation for the process and constructive feedback from peers.

Assessment of Student Learning Outcomes:

Review committees provided particularly candid feedback about the need for refinement of existing student learning outcomes, expertise in assessment design, and commitment to a clearly defined annual assessment schedule as part of the five-year program review cycle.

Progress on 2012 Improvement Recommendations:

Review committees found that most programs demonstrated progress on the previous cycle's improvement recommendations; however improvements were more often driven by general feedback (student surveys, faculty and work/field placement supervisors, advisory councils) than evidence from assessment of student learning outcomes. Going forward, as each institution undergoes its next full NEASC accreditation visit, it will be critical that each program's review "include

evidence of student success and program effectiveness” (NEASC Standard 4.6) and that the institution has “a demonstrable record of success in using the results of its evaluation activities to inform planning, changes in programs and services, and resource allocation” (NEASC Standard 2.8).

Review of Progress on 2016 Recommendations for the VSC System:

The following summarizes our system-level recommendations from the 2016 PreCIP cycle and actions in progress or planned to date:

1. *Expand current institutional research and reporting that could be conducted most efficiently on a system-wide basis.*  
COP has supported an expansion of system IR capacity from one to two FTE staff. System enrollment data now includes double majors. Program retention data is a priority for development within the next year. IR staff have investigated options for an enhanced system-wide collection of alumni employment data but concluded that at this time, the additional costs will outweigh any improvement in data quality.
2. *Continue collaborative discussions of pathways to include “reverse transfer.”*  
Potential next steps in outreach to students near the 60-credit threshold could include advising associate degree completion at sister VSC institutions.
3. *Continue to support and develop the PreCIP process as an opportunity for ongoing faculty development and collaboration.*  
Preliminary plans for the 2018 PreCIP faculty “mini-retreat” include a focus on student learning outcomes and curriculum design for programs undergoing significant change.

2017 Recommendations for the VSC System:

1. Provide focused expertise on learning outcomes assessment for faculty.
2. Develop data on program retention and internal (VSCS) transfer.
3. Implement a requirement for programs to define an annual assessment schedule as part of the five-year program review cycle as a means to ensure a sustainable approach to assessment-driven program improvement.



## PreCIP Reports

# Ecological Studies, Environmental Science, STEM Studies Summary Report

**Vermont State Colleges System  
PReCIP Review Committee Summary Report  
Ecological Studies, Environmental Science, STEM Studies  
October 16, 2017**

Programs Reviewed

- CCV: Environmental Science
- CCV: STEM Studies
- CU: Ecological Studies
- CU: Environmental Science
- JSC: Environmental Science
- LSC: Environmental Science, Natural Sciences, and Sustainability Studies

Committee

Clare Ginger, Associate Professor, UVM Rubenstein School  
Leslie Kanat, Professor, JSC  
Candace Lewis, Associate Academic Dean, CCV  
Ben Luce, Associate Professor, LSC  
Jonathan Spiro, Academic Dean, CU  
Andrew Vermilyea, Assistant Professor, CU

The committee met on September 15, 2017 at the VSC Chancellor's Office in Montpelier to review the six programs.

**I. Program Overview & Enrollment History**

CCV: Environmental Science

The Community College of Vermont's A.S. in Environmental Science provides students with the knowledge and skills needed for entry-level positions and prepares graduates interested in pursuing advanced degrees for transfer to four-year institutions of higher learning. Core program requirements include courses in Biology, Environmental Science, Earth Science, computer applications, and current environmental issues. Students in the program have the opportunity to focus on natural resources or sustainable building technology. The program culminates with a required field experience course that allows students to apply knowledge and skills, gain confidence, and explore career options.

Enrollment in the Environmental Science program has been gradually decreasing since 2011. The program peaked in fall 2011 with 115 students but by fall 2016 the number of students had declined to 88. Of note, only seven of these students were pursuing the concentration in Sustainable Building Technology. Of further concern is the low female to male ratio (just 40% of the Environmental Science students are female, compared to 67% of CCV students overall). To be sure, CCV seeks to increase the percent of its students who are male, but the Environmental Science program seems skewed too far in the other direction.

We commend the program for adopting the Science Co-op Moodle page, which offer students a variety of academic, personal development, and career exploration activities intended to build an increased sense of community and understanding of the various science disciplines. We also

commend the program for offering dual enrollment courses that may be applied to this degree; unfortunately, enrollment in the courses is low at the moment.

We suggest that the program track its retention of majors, and consider how it can attract more women and members of underserved communities.

#### CCV: STEM Studies

CCV's A.S. in STEM Studies prepares graduates for entry-level positions in STEM related fields and those interested in pursuing advanced degrees for transfer. While some students enter the workforce following completion of the A.S. degree, the program is designed with sufficient flexibility to facilitate transfer pathways to programs at the baccalaureate level both within and outside the VSC. Students in the program choose a minimum of 23 credits from any combination of Allied Health, Architecture, Biology, Chemistry, Computer Information Systems, Environmental Science, Mathematics, and Physics courses. Core program requirements include a lab science course and a technical writing course. The program culminates with a required field experience course that allows students to apply knowledge and skills, gain confidence, and explore career options.

Enrollment in the STEM Studies program began robustly with 122 students in its first semester and has been increasing since its introduction in fall 2014. The highest enrollment occurred this past fall (2016) with 176 students. The percentage of CCV degree students in the STEM Studies program has increased from 2.9% in fall 2014 to 5% in fall 2016.

We commend the program for the continued increase in enrollment. We applaud the program for the encouraging trend in gender balance (as 52% of its students are now female). And we note with favor the fact that there are eight dual enrollment courses that may be applied to the STEM studies degree.

One possible way to increase enrollment could be to add more accessible introductory courses, e.g. Intro to Electronics, Intro to Design, Intro to Robotics, etc.

#### CU: Ecological Studies

The Ecological Studies program allows students to engage in an integrated science major that cultivates a broad understanding of the interconnectedness of living organisms and environmental systems, including the interactions between humans and the natural world. The program is geared toward students who desire to be informed citizens about the world around them, who strive to have a high level of environmental literacy, and who wish to apply sustainable, ecological concepts in solving problems in a variety of fields. The program is geared toward students who want to study science in the tradition of liberal arts and want a major flexible enough to combine with minors from other disciplines such as Business, writing, Political Science, Criminal Justice, etc. Graduates are prepared for careers in government and non-governmental organizations such as park naturalists, field technicians, wildlife specialists, and outdoor educators. Additionally, some students may pursue graduate programs in science education, natural resource management, and environmental law and policy.

Enrollment in the Ecological Studies major is not very high: it averages just twelve students. This may be because it is a fairly new major (it commenced in the fall of 2013), and it may also be because its role so far appears to serve as an off-ramp for students who conclude they would prefer not to pursue more rigorous science majors.

We commend the program for working with the Admissions Office to increase enrollment. And we are pleased that the program's graduates are getting jobs in their field.

#### CU: Environmental Science

The Environmental Science program at CU integrates the study of biology, chemistry, geology, and physics to provide students with a strong scientific framework from which to analyze environmental programs. Courses in the major combined with courses in the liberal arts help to prepare students to interpret scientific data and effectively synthesize solutions to better manage human interactions within the natural world. The program is designed to prepare future environmental scientists to pursue graduate degree programs in environmental chemistry, toxicology, hydrology, systems ecology, environmental health, and ultimately leading to careers in government, industry, academia, and the non-profit sector.

From 2007 to the present, the median number of students in the program has been steady at 27 (up two students since the last PReCIP report in 2012). Interestingly, the program consistently has more first-year students than 2<sup>nd</sup> through 4<sup>th</sup> year students, and the graduation rate is fairly low (just 3.2 students per year). This is mitigated by the fact that (a) many first-year students eventually conclude that Environmental Science is too rigorous for them, so they opt to major in Environmental Studies or Ecological Studies, and (b) many students decide that they want to major in a specific discipline (e.g. Biology, Chemistry, Geology). While this causes some attrition in the program over time, we do not view this as a problem as we suspect that the students are retained in the Department of Natural Sciences.

We commend the program for recruiting a significant number of students to Castleton (12 per year), and for making efforts to increase retention and graduation rates. The program's social media efforts are especially praiseworthy. We also applaud the program for inculcating careers into its curriculum.

We suggest that the program devise a way to track students who leave the major in their first year, in order to quantify how many are leaving the system and how many are simply moving into other majors.

#### JSC: Environmental Science

The Environmental Science program at JSC provides students with the skills, knowledge, and understanding that serve as the basis of productive employment, civic involvement, and lifelong learning. Many of the courses are interdisciplinary in nature and have a strong foundation in the sciences, yet focus on connecting science, with nature, and society. The program emphasizes field work, laboratory instruction, and classroom activities, with the goal of enabling students to make well-informed decisions about our common future. The program has two concentrations: The Analysis & Assessment concentration is a research-based approach that focuses more heavily on laboratory and field courses and prepares students for more technically orientated positions in the

environmental field and for graduate programs in the sciences. The Policy & Advocacy concentration is for students interested in the development of public policy and the management of natural resources.

Enrollment in the program plummeted ten years ago (from a high of 49 majors in 2007 to a low of 18 majors in 2010), yet since then, enrollment has been slowly, yet steadily increasing. The recent redesign of the program, as well as the implementation of external grants, will continue to lead to a slow but steady resurgence in enrollment (which hit 21 in 2016) and the number of degrees awarded (9). As with CCV's Environmental Science program, 40% of the students in JSC's program are female.

We commend the program for garnering a number of grants (e.g. the NSF EPSCoR Grant, the BREE grant, and the NSF START) and for its high persistence rate. We note that 63A% of the START scholars who received support from the National Science Foundation are women. To bolster enrollment even further, we suggest that the program work with the Admissions office to engage potential students, pre-register new students in a science course in their first year, assign to new students a co-advisor who is a faculty member in the program, and explore the possibility of hiring a specialist in Policy & Advocacy.

#### LSC: Environmental Science, Natural Sciences, and Sustainability Studies

Lyndon's Department of Natural Sciences (DNS) offers Bachelor of Science degrees in Environmental Science, Natural Science, and Sustainability Studies. The overarching goal is to prepare students for successful careers in scientific research, ecological assessment, environmental advocacy, restoration and preservation, bioremediation, renewable energy, sustainable agriculture, energy efficiency, recycling, and secondary education.

The program has a high retention rate and high graduation rate. Interestingly, after increasing gradually from 2007-2014, enrollment declined sharply over the past two years, perhaps due to a decline in the number of out-of-state students, a lack of marketing, and the fact that the website—which was built outside the lyndonstate.edu domain—was down for a few years.

We commend the program for its partnership with the Lyndon Learning Collaborative, in which the laboratory portion of the biology courses is taught on the LSC campus, so students develop a familiarity with the campus and have a financial incentive to matriculate at LSC.

If feasible, we suggest that the institution increase marketing for these programs. And with a male to female ration of 3:1, we suggest that the department encourage women to join their programs.

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In sum, it is evident that all the curricula of the programs under review contribute to their institution's mission, and that they are doing their best, with limited resources, to maintain enrollment in a challenging demographic environment.

## **II. Assessment of Student Learning Outcomes**

### CCV: Environmental Science

The program has a comprehensive list of learning outcomes that are published in the college catalog. The list is a well-organized set of reasonable outcomes that focus on the key knowledge, skills, and values to be learned in the program. But we suggest that the program review the outcomes with an eye toward simplifying them.

The outcomes are assessed by the Science & Allied Health Curriculum Committee in collaboration with course faculty, academic advisors, and an advisory committee. The Curriculum Committee is led by one faculty and one staff co-chair. Committee members include five faculty members, two academic staff members, and the college's Chemical Hygiene Officer. The group meets monthly throughout the academic year and manages the overall plan for assessing environmental science SLOs. Assessments include the collection of aggregate data of student success for course EOs aligned with SLOs as reported by faculty on end-of-semester evaluations; supervisor feedback from professional field experience; dean interviews of students near graduation; and surveys of environmental science graduates.

Data from faculty assessment of student performance indicate that students are largely meeting expectations for those key course essential learning objectives associated with program learning objectives. Most students report they are prepared, and supervisors in the field say the students "meet expectations." Overall, faculty agree that students have met expectations regarding program learning outcomes. Yet, data also suggest areas for continued improvement particularly in the areas of quantitative reasoning, understanding of the hydrological cycle, and career exploration.

The assessment system appears to be sustainable and the outcomes are more or less assessable. We suggest that the program think about making them more measurable, and perhaps bring in an external reviewer to apply a rubric to sample assignments. The program could also explore the possibility of a project-based capstone course.

### CCV: STEM Studies

The student learning outcomes for the STEM studies degree are published in the college catalog. We recommend (based on student interviews) that the program do more to ensure that students are aware of the learning outcomes and understand how their course choices align with learning outcomes.

The outcomes are assessed by the Science & Allied Health Curriculum Committee in collaboration with course faculty, academic advisors, and an advisory committee. The committee is led by one faculty and one staff co-chair. Committee members include five faculty members, two academic staff members, and the college's Chemical Hygiene Officer. The group meets monthly throughout the academic year and manages the overall plan for assessing environmental science SLOs.

Given the flexible design of the STEM studies program, assessment of program learning outcomes has proven challenging for the curriculum committee. Flexibility and choice within the program serve to meet the needs of diverse student pathways; but the number of course options makes it difficult to identify consistent areas for measuring student mastery of program learning outcomes. At this time, the committee is able to draw on student assessment of mastery as provided in

graduate surveys and supervisor assessment provided during the field experience course.

Data from students indicate a high level of confidence in student learning outcome preparedness in most areas. Most students report they are prepared, and field supervisors say they “meet expectations.” But students did identify a desire for more career and educational pathway exploration. Many CCV degree programs have addressed the desire for increased career and educational awareness by incorporating career exploration into introductory courses required for the degree program. The STEM studies degree lacks such an introductory program requirement for all students, making it difficult to ensure all STEM studies students explore careers within their coursework.

#### CU: Ecological Studies

The program is not doing an adequate job of formulating and assessing its learning outcomes. To be sure, the program is only four years old, so only limited assessment tools have been implemented and none have been analyzed. Looking forward, the program should:

- Develop a comprehensive list of learning outcomes that are specific to this program.
- Make sure that the outcomes are assessable.
- Develop a sustainable plan to assess the learning outcomes and use that data to improve the program.

#### CU: Environmental Science

The program is not doing an adequate job of publicizing or assessing its learning outcomes. We suggest that they devise a comprehensive and sustainable assessment plan to imbed the student learning objectives in the curriculum and then assess whether the students are meeting the goals.

#### JSC: Environmental Science

The program has a comprehensive list of learning outcomes. We commend the program for developing rubrics to assess the learning outcomes; but we ask the program to consider whether the rubrics correlate to the learning outcomes.

We are concerned about the low response rate (N=2) from the program’s graduates. We are similarly concerned that the Dean did not interview the program’s Seniors in 2016.

#### LSC: Environmental Science, Natural Sciences, and Sustainability Studies

Five years ago, the Department of Natural Sciences designed a four-component process for assessing the level of student attainment of the learning objectives. The process proved too cumbersome to administer and did not yield usable data. Therefore the department developed an Advisory Board assessment for graduating seniors. The board uses a rubric to grade the annual senior presentations.

We commend the DNS for its willingness to discard an ineffective assessment regime. We further commend the program for its ongoing efforts to improve the rubrics. We suggest that the program investigate whether the senior presentations are a useful but perhaps not sufficient vehicle for students to demonstrate whether they have attained most of the program’s learning objectives. The program could consider augmenting the assessment role of the presentations by including assessing outcomes along the way, gauging the improvement of students via a pre and post test,



gathering more data on the success of graduates, and asking asking alums what they found lacking in the program after encountering the real world.

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In sum, while some of the reviewed programs still have work to do, most programs are utilizing a variety of direct and indirect measures to determine the extent to which they are meeting their student learning outcomes.

### III. Program Planning and Review

#### CCV: Environmental Science

The program regularly reviews and revises the course offerings. The college as a whole participates in an annual cycle of curricular review and revision. The process begins in late summer with the solicitation of proposals for new courses and programs and recommendations for revisions. Proposed changes impacting the Environmental Science program are then reviewed by the Science & Allied Health Curriculum Committee, which forwards change recommendations to AC where they are formally reviewed before adoption the following academic year.

In the past few years, the program has addressed the recommendation of the previous Policy 101 report that were relevant to CCV:

- *Recommend greater collaboration among the baccalaureate institutions with the Community College of Vermont so that pathways for students to achieve advanced education are clearly articulated.*

The program created a transfer pathway to Castleton University, as well as to six baccalaureate programs at UVM in the Rubenstein School of Natural Resources and College of Arts and Sciences.

- *Consider adding additional core competencies in the areas of policy, informatics, and wildlife issues.*

The program collaborated with the external reviewers to get clarity on specific laws, policies, etc. every student should be aware of and incorporated those into program courses.

- *Ensure that the content of the courses within the major reflect current best practices.*

This is the primary work of curriculum committees' annual review of the curriculum to ensure quality, currency, and relevancy. In addition, members were added to the advisory committee with expertise in environmental science in 2013.

- *Create a bridge between the programs and the Agency of Natural Resources so that students have additional internship and research opportunities.*

This has not been done in a formal way, but the Science Co-op serves as a venue for ensuring that students and faculty are aware of internship opportunities.

- *Imbed career exploration into an early course in the major.*

The curriculum committee added a specific essential objective in ENV 1010 Introduction to Environmental Science to address career exploration.

- *Track graduates for successful transfer and employment placement.*

The college continues to survey graduates both college-wide and for the program review.

- *Consider offering Chemistry I and II at all academic centers to ease the transferability of the graduate.*

When the Montpelier and Rutland centers were built, CCV put in place the infrastructure for these courses.

- *Bring equity to lab facilities at each academic center.*

CCV utilizes institutional funds along with grant funding to strategically develop and enhance lab facilities across the state.

- *Modify current science and allied health advisory committee to ensure representation for environmental science.*

In 2013, three members were added to the advisory board to increase representation for environmental science.

- *Implement program assessment plan, collect evidence, evaluate student learning, and communicate information to faculty.*

Greater efforts still need to be made in this field.

#### CCV: STEM Studies

The program regularly reviews and revises the course offerings. The college as a whole participates in an annual cycle of curricular review and revision. The process begins in late summer with the solicitation of proposals for new courses and programs and recommendations for revisions. Proposed changes impacting the Environmental Science program are then reviewed by the Science & Allied Health Curriculum Committee, which forwards change recommendations to AC where they are formally reviewed before adoption the following academic year.

No programmatic changes have been made since the STEM Studies degree launched in 2014. This is the first time the STEM Studies program has undergone the PReCIP review process.

#### CU: Ecological Studies

The Natural Sciences Department meets twice annually to evaluate curriculum and assess program outcomes. All curriculum changes are reviewed first by the department, then pass through the Curriculum Committee and then are presented to Faculty Assembly for a full vote.

The program maintains contact with graduates to ask what aspects of the program served them well and what can be done better.

We commend the program for following the guidelines of the Ecological Society of America for professional ecologists.

The program was approved in 2013 so this is their first PReCIP review.

#### CU: Environmental Science

The program conducts an annual review of the Environmental Science curriculum during the fall semester. Previously, assessment data was not used to inform changes to the program. However, we commend the program for planning to start reviewing assessment data every other year (as the capstone Biogeochemistry course will now be offered every other year).

The program addressed most of the recommendation of the previous Policy 101 report that were relevant to CU:

- *Consider implementing the LSC model of moving a faculty member, who has interest in and expertise related to the assessment of outcomes process, out of the faculty for a two-year period to become the Director of Assessment at each college.*

This was not implemented. At CU, assessment is the purview of the Associate Academic Dean and the Assessment Committee of the Faculty Assembly.

- *Recommend greater collaboration among the baccalaureate institutions with the Community College of Vermont so that pathways for students to achieve advanced education are clearly articulated.*

There has been considerable progress made in establishing ENV pathways between CCV and Castleton.

- *Consider adding additional core competencies in the areas of policy, informatics, and wildlife issues.*

Increased statistical rigor has been added to the major with the addition of Biostatistics. The Environmental Science program emphasizes the foundational science behind environmental issues; if students want to emphasize wildlife issues they can now pursue the Ecological Studies major. Students are encouraged to minor in Environmental Studies, which looks at the human aspect of environmental issues (i.e. policy, etc.).

- *Ensure that the content of the courses within the major reflect current best practices.*

The program's content is very relevant and current.

- *Create a bridge between the programs and the Agency of Natural Resources so that students have additional internship and research opportunities.*

The program embraces this in concept, but there is little time available for faculty to initiate and maintain such relationships or programs.

- *Consider employing an overall laboratory coordinator /instructor*

This has been implemented.

- *Consider renaming the Environmental Studies major to something that may be inclusive of additional content, such as Ecological Studies.*

CU has the best of both worlds: an Environmental Studies major and an Ecological Studies major.

- *Work on articulation pathways with UVM, CCV, and the other VSC institutions.*

The program now has articulation agreements with CCV, Vermont Law School, Norwich University, and Quinsigamond CC in Massachusetts.

#### JSC: Environmental Science

Other than informal discussions among the faculty, there does not appear to be a formal process for program planning and review.

The program was not able to implement most of the recommendation of the previous (2012) Policy 101 report:

- *Consider implementing the LSC model of moving a faculty member, who has interest in and expertise related to the assessment of outcomes process, out of the faculty for a two-year period to become the Director of Assessment at each college.*

This was not implemented by the administration.

- *Recommend greater collaboration among the baccalaureate institutions with the CCV so that pathways for students to achieve advanced education are clearly articulated.*

JSC has focused its efforts on planning unification with LSC during the recent academic year, but in previous years the ENV program had worked out a comprehensive articulation agreement with CCV.

- *Consider adding additional core competencies in the areas of policy, informatics, and wildlife issues.*

Did not implement, due to lack of capacity. (To be sure, the department has recognized for many years the need to hire an individual who has the appropriate credentials and experience to work in the policy and organismic level arenas, but approval to fill the faculty vacancies has not been forthcoming.)

- *Ensure that the content of the courses within the major reflect current best practices.*

Recent changes were implemented that start to address this.

- *Create a bridge between the programs and the Agency of Natural Resources so that students have additional internship and research opportunities.*

The program has a strong relationship with the Agency of Natural Resources and several graduates are employed there.

- *Consider employing a grants coordinator to be sure that grant implementation and deadlines are consistently met.*

There was no funding to implement this.

- *Consider workload reallocation for faculty who are engaged in grant work or major program review work.*

There was no funding to implement this.

- *Review the configuration of the major, and the department, with the goal of one major with two tracks.*

This process was implemented, as in 2014 the Integrated Environmental Science major and the Environmental Science/Natural Resource major merged to become the B.S. in Environmental Science, with two concentrations: Analysis & Assessment and Policy & Advocacy. Since its implementation in 2014, some changes have been made to better meet the needs of the students and the ability to deliver the courses.

#### LSC: Environmental Science, Natural Sciences, and Sustainability Studies

The Department of Natural Sciences conducts curricular reviews at department meetings and at least one annual retreat, depending on tasks. The review follows the continuous improvement plan, which consists of incorporating the findings of the external advisory committee, student course evaluations, student retention and graduation data, and faculty impressions. Specifically, the department discusses and develops curricular changes based on previous assessment data and current professional activities, and following each spring semester, evaluates and incorporate new student learning outcome data.

The program did a good job addressing many of the recommendations from the 2012 cycle:

-ENV SCI recommendations:

- *Improve contacts with graduates for the purpose of tracking their placement and success.*

The program established a database for tracking purposes and also maintains contact with graduates through social media (Facebook and LinkedIn).

- *Maintain a complete and easily accessible repository for the collection of assessment data.*

The program established an excel file to hold assessment data.

- *Consider replacing the Chemical Hygiene Office (CHO) when the incumbent retires.*

When LSC and JSC unify, they will probably share the CHO between the two campuses. We note that the program objects to this approach on the grounds that they require a full-time technician on site.

- *Improve access to upper level courses so that students waiting time to enroll is decreased.*

This issue was not addressed due to lack of staffing; however the program revised its scheduling process to avoid conflicts. In addition, the program is considering curricular changes to increase flexibility of course choices at the upper level (e.g., creating categorical requirements rather than specific course requirements).

- *Evaluate opportunities for lab facility sharing with JSC.*

The program feels that the geographic distance between the two campuses renders this an unrealistic proposal.

-NAT SCI recommendations:

- *Track those who exit the program.*

The program established a database for tracking purposes and also maintains contact with graduates through social media (Facebook and LinkedIn).

- *Explore ways to make the connection between Natural Sciences and secondary education more appealing.*

The program explored potential program changes in this area but found it difficult to attract students to a teaching track when other, more appealing career tracks are readily available.

- *Make the program's web presence an effective tool for student recruitment.*

The program upgraded its web presence.

- *Explore ways, separate from required evaluations, to facilitate pedagogical exchange among faculty.*

Several faculty engaged in significant pedagogical exchange with other faculty, both internally and externally. Internally, Professors Giese, Lathrop, and Balcom worked closely together on creating an integrated course structure, and this involved not just integrated the courses per se, but had a very particular pedagogical viewpoint that Professor's Giese and Balcom researched thoroughly ahead of time. Externally, Professors Lathrop and Luce attended workshop sessions with other faculty on flipping courses, and Professor Luce received support from the College on developing flipped courses, and fully implemented this in his teaching. Professor Lathrop is planning on doing so as well in the future.

- *Break the learning outcome on conducting original research into measurable segments.*

This was not addressed.

- *Work with college administration to develop a plan for internal budgeting and/or external gifts to address the laboratory infrastructural needs of the Department.*

A combination of LSC facilities funds and external grant funds were used to renovate two labs, two classrooms, and the science-wing hallway.

#### **IV. Continuous Improvement Plan**

*We make the following recommendations for improving Environmental Sciences, STEM Studies, and Ecological Studies across the VSC system:*

1. If feasible, each department should meet with an outside assessment expert (from the VSC system) to stimulate their thinking about assessment and to assist with developing tools to enhance assessment.
2. Each program should explore ways to increase enrollment by women.
3. The VSCS should consider:
  - developing a process to track alums and students who change majors.
  - creating an office that outreaches to businesses and government agencies (e.g. the ANR) for internships and post-graduate careers.
  - reviving the grants office.
4. NVU should investigate purchasing scheduling software for classroom allocation at the two campuses.

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*Our recommendations for each of the six programs under review are as follows:*

##### CCV: Environmental Science

1. Given enrollment trends in Sustainable Building, evaluate the viability of this focus. Is the scope too narrow? Can we keep some of the courses but eliminate the focus?
2. The Science & Allied Health Curriculum Committee is going to explore the possibility of offering a project based capstone course. We endorse this endeavor.
3. Take steps to emphasize career exploration in this program, either with a specific course, or through enhanced advising, or by embedding career exploration throughout the curriculum.
4. Work with the faculty to embed additional experiential learning activities and project-based learning into this program's courses and to reduce overlap in course content and assignments. Consider holding professional development training for ENV faculty to discuss PReCIP findings and SLO measurement.
5. Strive to develop direct measurement tools for the program's student learning outcomes.
6. Consider ways to expand the appeal of the program to women and underserved communities.
7. Explore whether it would be beneficial to create pathways to Northern Vermont University.

##### CCV: STEM Studies

1. We recommend that the Science & Allied Health Curriculum Committee evaluate all of its program outcomes as part of the curriculum change cycle for AY 18-19 to ensure that the



outcomes are measurable and can be applied to students taking a variety of coursework. The committee could also explore the possibility of a project-based capstone course that could be applied to Environmental Science students as well as STEM studies students.

2. Given that the STEM program lacks a common introductory course, explore innovative ways to embed career exploration throughout the curriculum.
3. Work with the faculty to embed additional experiential learning activities into the program's courses. Consider holding professional development training for STEM faculty to discuss PReCIP findings and SLO measurement.
4. Define resources and minimum required infrastructure for expanded delivery of lab science courses.
5. Develop advising tools to assist students with career exploration and understanding educational pathways through the STEM studies degree.
6. As more students start to follow the pathways, explore ways to assess student learning through feedback from baccalaureate program faculty.

#### CU: Ecological Studies

1. Develop a comprehensive list of assessable learning outcomes that are specific to this program. Remove "life-long learning" from the current list of objectives and replace it with "self-learner or "independent learner").
2. Develop a sustainable plan to assess the learning outcomes and then use that data to determine if any improvements can be made to the program.
3. Consider revising the rubric used to evaluate student presentation so it includes a wider variety of options (besides "Yes" or "No").
4. Encourage students to participate in internships.

#### CU: Environmental Science

1. If feasible, hold a retreat each year that is dedicated to assessment.
2. Embed the student learning objectives into the curriculum, and develop a robust plan to assess the learning objectives by creating assessment activities and rubrics for each SLO.
3. Create an upper-level common course (e.g. BioGeoChem) or capstone experience where assessment can occur.
4. Track students who declare the Environmental Science major in their first year but subsequently leave the major, in order to determine if they are leaving the university or simply moving into other majors. If the former, determine if the program can do a better job of retaining first-year students.

5. Develop a viable plan (perhaps by working with the administration or the Chancellor's Office) to track alumni progress.

JSC: Environmental Science

1. Implement a comprehensive plan to assess the student learning objectives. Align rubrics with the learning outcomes, and utilize the rubrics more frequently and in more classes.
2. Explore whether it would be beneficial for NVU to create pathways from CCV.
3. While these issues are beyond the purview of the PReCIP Review Committee, we acknowledge the program's desire to improve by:
  - working with Admissions to engage potential students;
  - seeking additional sources of external funding to assist in research and provide summer financial support for research students;
  - hiring a grants coordinator to provide assistance in all stages of proposal development and grant maintenance;
  - recruiting an instructor to teach courses in Policy & Advocacy;
  - arranging student internships;
  - assigning to new students a co-advisor who is a faculty member in the ENV program;
  - developing a workload reallocation policy that would enable instructors to conduct research.

LSC: Environmental Science, Natural Sciences, and Sustainability Studies

1. Continue to monitor the programmatic changes to see if they have positive effects.
2. Consider implementing additional vehicles throughout the program in order to assess the student learning objectives and augment the lessons learned from the Senior presentations.
3. Collect comprehensive data on the competency of graduating students and adequacy of the programs in preparing graduates for work in scientific fields.
4. Strive to make transferring into the program an easier experience for students.
5. Conduct outreach to students who have left the program for other programs or have dropped out.
6. Explore whether it would be beneficial for NVU to create pathways from CCV.
7. While these issues are beyond the purview of the PReCIP Review Committee, we acknowledge the program's desire to improve by:
  - making students more aware of the services provided by the Career Office;
  - garnering support for student research and getting help finding internships for students;
  - increasing marketing for the program;
  - hiring a full-time lab technician;
  - developing an organic farm and greenhouse.

# Biology Review Committee Summary Report

**VSC PReCIP**  
**Biology Review Committee Summary Report**  
September 11, 2017

Committee

Jeanne Harris, Associate Professor of Biology, University of Vermont  
Elizabeth Dolci, Professor, Johnson State College  
Preston Garcia, Associate Professor, Castleton University  
Philip Petty, Vermont Tech, Facilitator

The review committee met on September 11, 2017 at the Office of the Chancellor in Montpelier. Dr. Harris, external committee member, Dr. Dolci and Mr. Petty were present in-person while Dr. Garcia participated via Adobe Connect. The PReCIP process and the day's agenda were explained to the group. The committee engaged in an open and collegial discussion of the Biology programs that are offered at each institution.

**Overview of Programs**

Castleton University (CU) offers three degree programs in Biology – B.S. in Biology, B.S. in Biology with a concentration in Molecular Biology and Biomedicine, and B.S. Biology with a concentration in Ecology and Evolutionary Biology. Johnson State College (JSC) offers three Biology degree programs - B.S. in Biology, B.S. in Biology with a pre-medical concentration and B.A in Biology / Field Naturalist. Each of CU's programs require 122 total credits with 62-66 credits earned in the major depending on the concentration. JSC's programs require 120 total credits with 55-67 credits earned in the major depending on the concentration. In the fall of 2016, Castleton University and the Albany College of Pharmacy and Health Sciences (ACPHS) initiated a 3+4 program where high-achieving students can earn a Bachelor's degree in just three years at CU and a Doctor of Pharmacy degree in four years at ACPHS.

All of these programs are in line with their institutional missions. Biology degrees at both colleges are designed to prepare students for direct entry into employment in a wide variety of biological occupations, admission into graduate school or entry into a professional program.

Total Biology enrollment at CU is relatively stable. Since 2012, the average number of biology students was 50. Retention from Freshmen to Sophomore year has been highly variable, ranging from only 33% of the students retained to a high of 91% of the students retained. The past couple of years the student drop rate was about 10%, (90% retention rate), much better than the Freshmen to Sophomore retention rate across the whole university. Biology programs at CU have graduated 8 students in each of the past three years. In 2017, 5 graduates had a concentration in

Molecular Biology and Biomedicine, 1 graduate had a concentration in Ecology and Evolutionary Biology, and 2 students earned a general biology degree.

At JSC the number of students majoring in Biology has increased 31% from an average of 32 students in 2007-2011 to about 46 students 2012-2016. The increase tracks, in part, to the creation of the B.S. Biology – pre-medical degree. Female enrollment in biology has significantly increased since 2012 and resulted in the highest proportion of female students in STEM majors at JSC (female:male biology student ratio 1.61 during 2012-2016). On average, there are 6.25 graduates/year in biology, very comparable to other JSC STEM degrees in Environmental Science and Health Science; and significantly higher than Mathematics or Integrated Science.

### **Assessment of Student Learning Outcomes**

Biology Student Learning Outcomes (SLOs) at CU were updated in 2016 and generally mirror the Natural Sciences department-wide SLOs. An additional outcome of a summative project or paper, and an outcome for civic learning have been added as capstones performed in a student's senior year. The capstone "experience" has landed in an existing course, BIO 4030 Evolution, taken by all biology majors. The parameters of the student project/assignment have recently been determined and will be implemented in the fall semester 2017.

CU's assessment of biology program SLOs is "Emerging" (see VSC State Colleges Academic Program Review for Evaluating the Quality of Program Assessment Systems). Faculty are in the early development of an overall assessment plan for the biology program. Processes for assessing student attainment of all program SLOs are currently under development. CU has assessed student mastery of biological concepts (SLO #1), in two years, via a commercial comprehensive exam, the Area Concentration Achievement Test, in the following content areas – Bacteriology, Cellular Biology, Ecology (including Field Ecology), Evolution (including Molecular Biology) and Genetics. Due to a 4 year gap between tests (2013 and 2017), comparisons are difficult; however, overall, students at CU are performing above the 80% percentile, nationally. Seniors achievement in Bacteriology is outstanding in the 94% percentile, and they demonstrated improved scores in Evolution and Cell Biology compared to 2013 scores. However, the 2017 score in Ecology was 50%, down 18 percentage points from 2013. Program faculty who cover Ecology courses are addressing the problem.

JSC's Student Learning Outcomes were revised in 2016 in preparation for their NEASC accreditation 10-year institutional review. A comprehensive multi-year assessment plan was developed. Data collection regarding the revised SLOs in their new assessment plan began in the summer of 2017. JSC's assessment of biology program SLO's, based on the VSC Rubric mentioned above, falls in-between "Emerging and Developed". Transition to the "Developed" category will require systematic, program-level data collection and analysis for all SLO's. Assessment

review and evaluation should result in significant curricular and/or pedagogical changes that improve student learning and program outcomes.

One of JSC's biology program SLOs (Communication in Science) has been measured via a rubric redesigned in 2014. Students are evaluated for their internship presentations based on 13 metrics scored 1 (low) to 5 (high). Although initial data indicated that students generally met the "capstone" Communication in Science SLO, faculty noted that the data did not reveal the level of mentoring students needed to prepare their presentation. Faculty decided that "better scaffolding" of student presentations in the curriculum was required. Implementation of this change is being addressed during this academic year.

### **Progress on 2012 Program Improvement Recommendations**

Progress on PReCIP program improvement recommendations resulting from the last review were noted. Specifically, the committee commends:

- Castleton for initiating and prioritizing the development of a biology program assessment plan and beginning to collect assessment data that measures student attainment of biology program SLOs
- Castleton for developing a plan where researchers receive a portion of the University's indirect costs collected from successfully funded grants. Fifteen percent of these costs are given back to faculty researchers for their own use.
- Castleton for improving its ability to offer upper level courses based on predictable projected enrollments
- Castleton for adding a capstone experience that supports interdisciplinary, undergraduate research and that is directed toward attaining one of the program's SLOs.
- Castleton for creating concentrations (Molecular Biology and Biomedicine; and Ecology and Evolutionary Biology) to respond to changing needs in the profession and interests of students.
- Castleton for exploring and implementing ways of increasing library resources while reducing or sharing costs.
- Castleton for ensuring all biology majors have a biology faculty as their academic advisor.
- Castleton for increasing support staff in the Natural Sciences department
- Johnson for reviewing and revising student learning outcomes and to assure that they are measurable.
- Johnson for creating a comprehensive, multi-year assessment plan for biology.
- Johnson for encouraging and increasing the number of off-campus research opportunities for students.
- Johnson for redesigning the Field Naturalist program with input from professionals, thereby planning for the long-term sustainability of the program.

- Johnson for strongly encouraging pre-med majors to take biochemistry
- Johnson for ongoing discussions with Lyndon State College biology faculty regarding JSC/LSC unification and the impacts this will have on their curricula, especially their upper level curricula

### **Recommendations for Improvement**

In reviewing the reports of each institution, as well as commentary provided by members of the Health Sciences Review Committee, the following directions for program improvement were identified:

#### Castleton:

1. Develop an overall biology program assessment plan where each student learning outcome can be evaluated via a valid quantitative or qualitative measure. Begin to systematically collect and analyze assessment data. Demonstrate that review of the data results in continuous program improvement – significant curricular and/or pedagogical changes.
2. More clearly articulate the differences between the BS.BIO.EEB (biology with a concentration in Ecology and Evolutionary Biology) and the BS.BIO.MBB (biology with a concentration in Molecular Biology and Biomedicine; especially how each concentration provides a path toward a particular graduate degree or professional career.
3. If national Area Concentration Achievement Test (ACAT) scores are utilized in CU's overall assessment plan, ensure that the tests are offered each year and that there is a reliable source of funding to purchase the tests.
4. Address CU's relatively poor student performance in the ACAT Ecology test.
5. Increase opportunities for faculty discussion of program assessment, program currency and program relevance. Consider forming a biology program Advisory Committee made-up of career professionals, program alumni and CU faculty.
6. Ensure that there is adequate support staff to prep science laboratories, maintain lab instrumentation, and provide a safe laboratory environment.
7. Increase organismal biology course offerings in botany and zoology.
8. Enhance the list of research and academic equipment by purchasing several essential items – full-size autoclave with appropriate set-up and installation; large scientific freezer to store temperature sensitive biological materials; and the equipment and supplies needed support a biochemistry lab.

#### Johnson:

1. Hire faculty to restore the organismal biology position vacant since 2009. The National Association of Biology Teachers recommend a minimum of four

- faculty in a biology program. The JSC biology program currently has two FT faculty.
2. Fully implement the biology program's assessment plan. Demonstrate that assessment data is systematically collected and analyzed and that review of the data results in continuous improvement – significant curricular and/or pedagogical changes.
  3. Provide efficient and comprehensive support in Information Technology that addresses software and hardware needs of faculty.
  4. Establish an internal source of funding to support faculty-mentored undergraduate research and creative work. This would include workload reallocation from teaching to carry out research with undergraduates, stipends for faculty supervision of undergraduate research during summer and academic year, student stipends for summer research, and a budget line for equipment.
  5. Hire a full-time grants coordinator to support research endeavors, including both pre-and post-awards.
  6. Maintain the position of lab coordinator that has adequate hours to carry out all responsibilities related to the preparation of all teaching labs.

VSC:

1. Provide professional development opportunities for faculty in developing assessment plans.
2. Hire a grants coordinator with background in NIH and NSF protocols to provide assistance at all stages of proposal development, to help identify appropriate funding opportunities, and to provide administrative support to ensure compliance with state and federal regulations.
3. Provide direct access to student records by all program faculty, and not limited to only college assigned advisors. This would offer students better advising (not just from the assigned faculty advisor, but from a broader array of helpful advocates) and would expedite early interventions when students struggle academically or emotionally.

**Other Notable Observations from the External Committee Review**

1. The impact of the Castleton University / Albany College of Pharmacy and Health Sciences 3+4 B.S. in biology and Doctorate in Pharmacy articulation is too early to assess.
2. Anecdotally, the freshmen to sophomore biology major dropout rate at CU is highly affected by the student perception that the program is “difficult”.
3. Minimum enrollment requirements often prevent CU biology students from taking advanced courses in their areas of interest.
4. The Natural Sciences department, as a whole, has embarked on several new recruitment strategies including use of social media platforms; liaisons with



- Admissions, Alumni and the Development Office; and personalized text messages sent to all accepted students.
5. CU has implemented several activities to increase the success of underprepared students – a Biology specific First-Year Seminar lab section, a three course introductory sequence designed to help students with marginal or distant background in the basic concepts of biology and chemistry, creation of a weekly Science Colloquium course that introduces students to outside speakers involved with research, and Pathways to Science, a second-semester science majors' course that emphasizes basic, science-related skills, and helps students plan for careers in science and/or graduate school.
  6. CU's Natural Sciences Department Research Day at the end of each academic year is a very successful event. Last year, 40 individual students presented their research, the largest number ever.
  7. CU's "student voice" comments were very positive and demonstrated a very high satisfaction with the biology major, especially pre-med students.
  8. Both CU and JSC evaluate their programs against the "Guidelines for the Evaluation of 4-year Undergraduate Biology Programs" produced by the National Association of Biology Teachers.
  9. Both CU and JSC remarked on how effective they found the "Small World Initiative", an innovative program that encourages students to pursue careers in science while addressing a worldwide health threat – the diminishing supply of effective antibiotics.
  10. Both JSC full-time faculty have active research programs. 36 undergraduates were engaged in summer research during the past 5 years.
  11. JSC reports that students who get involved with research persist to graduate.
  12. JSC biology faculty believe that "professional first-year advisors" are not as effective academic advisors as are full-time biology faculty, therefore JSC biology faculty request to be co-advisors for biology students.
  13. Senior thesis research is a capstone for JSC B.S. majors. Students conduct a research project in conjunction with an internal or external investigator. Student research is presented each spring semester in the Senior Thesis Research Presentation Seminar.
  14. JSC biology maintains a collaborative partnership with the Vermont Genetics Network
  15. JSC now provides Principal Investigators or the Principal Investigator's department 25% of the indirect grant revenues received. The Environmental and Health Sciences department uses these funds to support summer student research (\$5,000 for 10 weeks). Sixteen students have benefited over the last three years.
  16. President Collins initiated a competitive application for faculty to apply for one, three-credit teaching workload reduction to carry out research.
  17. The unification of JSC and LSC should increase the diversity of course offerings at the upper level.
  18. JSC-LSC unification will undoubtedly impact the biology programs at JSC and the LSC programs that require biology, in yet to be determined ways. Impacts will likely be positive and negative.

pWp

# Outdoor Education/Recreation/Sports Management Summary Report

## Vermont State College

### Policy 101

#### Program Review and Continuous Improvement Process (PReCIP)

##### Category Reviewed:

VSCS Program Review Committee for Outdoor Education/recreation/sports management

##### Programs Reviewed:

CU: B.S. in Sports Administration  
JSC: B.A. in Outdoor Education  
LSC: B.S. in Mountain Recreation Management

##### Date of Review:

September 26, 2017

##### Participants:

*Marybeth Lennox*, Assistant Professor, Castleton University  
*Brad Moskowitz*, Professor, Johnson State College  
*Sean Doll*, Associate Professor, Lyndon State College  
*Julia Muller*, Consultant, 3 Fold Group  
*Ted Teegarden*, Director of Outdoor Education, White Mountain School  
*Allan Rodgers*, Interim Dean of Academic Affairs and Strategic Planning, Vermont Tech, and  
Committee Facilitator

## **Introduction**

The programs submitted thoughtful, self-reflective assessment of their programs. The two external evaluators were knowledgeable about the programs and were extremely laudatory about the programs and their graduates. The discussion was marked by candor and collaboration and resulted in gracious acceptance of suggestions and recommendations.

## **I. Program Overview &**

### **Enrollment History**

*Intent: Programs reflect and are consistent with the mission of their institutions and also strengthen them. As appropriate, programs contribute to achievement of college priorities.*

### **Observations:**

All three programs are in alignment with their institutional missions.

CU: The Sports Administration program has a large service learning and experiential learning component which clearly links to the University's mission of "outside-the-classroom learning." Enrollments have been stable with a slight recent dip. Males significantly outweigh females in the program. Retention data is not retained. Graduation rates are consistent.

JSC: The outdoor education mission is clearly articulated, and aligns with the college's general mission of "...interdisciplinary and... experiential learning." Enrollments experienced a 20 to 25% decline in 2013-2014, but enrollments have been stable over the last three years. Reportedly, the Outdoor Education has not been highlighted as a "signature program" by the college in recent years. Persistence towards graduation appears to be high.

LSC: The program mission and college mission are well aligned through their mutual commitment to develop professional skills and ethics. The program goals are clear and well-articulated. Enrollments have declined in the last three years, although retention rates have increased, attributed to new faculty hires and more aggressive focus on students at risk.

### **Recommendations:**

- Where absent, establishing a program mission statement and periodic review of the statement will assist in alignment of the program and college's mission.
- A more gender diverse recruiting strategy is warranted to ensure a more representative student population.
- Where absent, retention rates should be collected and reviewed on an annual basis.
- Programmatic marketing by the colleges and leveraging the unique Vermont environment may benefit program enrollments.

## **II. Assessment of Student Learning Outcomes**

*Intent: Students acquire knowledge, skills, and values expected of entry-level members of the field. They are prepared for employment or further education in the field of study. Using a variety of direct and indirect measures, faculty regularly determine the extent to which the program achieves its student learning outcomes goals.*

### **Observations:**

CU: Program outcomes were clearly articulated. A senior exit interview evaluates the learning outcomes and is scaled. Overall, the scores are high, ranging from 8.4 to 9.5 on a 10 scale, however, there is some question about validity and no evidence of use of this data in continuous improvement. There are clear course links to specific learning objectives

JSC: Program outcomes were clearly articulated. All syllabi integrate course outcomes. Methods of outcomes assessment vary by course and some course assessments appear to be based on course grades. Job placement rates for graduates are high for those reporting, but reporting response rates are low.

LSC: Program outcomes were clearly articulated and are further expanded in the two concentrations. Students were interviewed for outcome achievements and the responses appear to have resulted in specific recommendation, although the process does not appear to be a repeated event.

### **Recommendations:**

- All three programs would benefit from specific, non-grade based assessments of outcomes on a course-by-course basis to avoid end-of-program gaps in program outcome attainment.

### **III. Program Planning and Review**

*Intent: Consistently delivering a high-quality educational program requires thoughtful planning but also honest and meaningful evaluation that is broad-based, systematic, ongoing, and supported by committed program faculty. Faculty and other academic resources must allow adequate time for class preparation, student evaluation and advising, program development and review, and professional development. This process will likely improve a program's effectiveness in achieving its SLO's.*

#### **Observations:**

All Institutions: Periodic course and curricular changes are noted. Annual program review seems to be primarily dependent upon anecdotal information or graduate-reported data. Program appears to not engage in periodic industry advisory committee meetings. While active in the industry, no process appears to be in place to collect regular, systematic data relating to industry trend on an annual basis. A regular, periodic outcomes review by faculty does not appear to be in place.

#### **Recommendations:**

- Where absent, programs would benefit from annual data collection, advisory committee review of curriculum and industry trends, and annual review of learning outcomes.

#### **IV. Continuous Improvement Plan**

*Intent: Program faculty collaboratively use periodic reviews to reflect on past efforts and outcomes and to plan the continuous improvement of the program. The resulting plans are living documents that regularly receive the collective attention of the faculty.*

#### **Observations:**

All three programs submitted continuous improvement plans with specific, time-bound, planned activities. All programs identified the need for documented, regular, systematic data collection for SLO evaluation. The need for internship measurement systems was noted by LSC.

#### **Recommendations:**

- Develop documented, regular, systematic data collection for SLO evaluation.
- Develop documented, regular, systematic collection of employer-related data to assess the effectiveness of program outcomes.
- Explore inter-departmental collaborations.
- Explore collaborations across VSC institutions.
- Where possible, increasing gender balance among faculty should be encouraged.



# Information Technology and Computing Review Committee Summary Report

**Vermont State Colleges System  
 Information Technology and Computing  
 Review Committee Summary Report, October 31, 2017**

Review Committee:

Candace Lewis, Associate Academic Dean, CCV  
 Jeremy Ouellette, Assistant Professor, Vermont Tech  
 Scott Hanselman, Assistant Professor, Castleton  
 Deborah Hughes, Associate Professor, Lyndon  
 Jim Hoag, Retired Faculty, Champlain College  
 Steve Loyer, President and CEO, The Tech Group  
 Yasmine Ziesler, Chief Academic Officer, VSCS

The PreCIP review committee for information technology and computing met on September 18, 2017 with representatives of all four programs and two external members for a candid and collegial discussion.

**I. Program Overview and Enrollment History**

<b><u>Program</u></b>	<b><u>Fall 14 Enrollment</u></b>	<b><u>Fall 15 Enrollment</u></b>	<b><u>Fall 16 Enrollment</u></b>	<b><u>13-14 Graduates</u></b>	<b><u>14-15 Graduates</u></b>	<b><u>15-16 Graduates</u></b>
<b><u>CCV</u> Computer Sys Management</b>	134	120	112	12	16	22
<b><u>Castleton</u> Computer Info Systems</b>	27	24	25	3	9	9
<b><u>Lyndon</u> Computing (A.S.) Computer Info Systems (B.S.)</b>	1 23	0 26	2 25	0 1	1 3	0 4
<b><u>Vermont Tech</u> A.S. in IT A.S. in Software</b>	16 11	11 8	6 9	4 2	3 5	2 4
<b>B.S. in IT B.S. in Software</b>	34 63	43 64	43 48	15 15	13 17	7 14
<b>M.S. in Software Engineering</b>			7			
<b>Post-Degree Certificates (all)</b>			6			1

CCV currently offers a single associate's degree in Computer Systems Management to prepare students "for entry-level information technology professions...[and] transfer to four-year institutions;" the Network Administration program was archived in 2016. Castleton's program "combines broad-based business courses with computer programming and IT courses in order to improve the students' understanding of how to properly design or select and implement technology solutions." Lyndon offers an A.S. in Computing and a B.S. in Computer Information Systems with concentrations in Software and IT, with the overall purpose "to prepare students to meet the computer technology needs of business, government, healthcare, schools, and other kinds of organizations." Vermont Tech offers associate's and bachelor's degrees in IT and Software Engineering designed to be 2+2 programs. Not included in this review are its new M.S. in Software Engineering and new post-degree certificates in Web Development, Computer Networking, Software Development, and Cybersecurity.

Enrollments were generally described as holding steady at Castleton and Vermont Tech, with modest growth at Lyndon attributed to the partnership with Northern Essex Community College. At CCV, the Computer Systems Management program has declined in enrollment consistent with college-wide trends attributed to Vermont's overall demographics. The committee discussed, however, the question of why more students don't enroll in programs with such clear workforce demand exceeding supply. One strategy identified was to work with admissions and marketing to clarify program outcomes and the range of job opportunities open to graduates. The committee reflected generally on the continued gender imbalance in these programs, a fact noted in the 2012 review, and recommended addressing this via marketing messages that emphasize the problem-solving nature of the field.

An additional concern discussed was retention within these programs, although committee members noted that without more data, it is unclear whether retention within these programs varies from college-wide retention rates either positively or negatively. Priority retention strategies recommended for these programs included strengthening students' general college readiness skills and focusing on the gateway programming courses in the major and developing students' expectations of persisting through failure (i.e. no one writes a computer program that works the first time). The committee specifically commended Vermont Tech on its design of the two major programs with the same initial two semesters of common core courses, so that students who begin in one program can seamlessly change to the other.

## **II. Assessment of Student Learning Outcomes**

The committee commended the programs for their serious approach to learning outcomes assessment. All programs have clearly articulated student learning outcomes; a mapping of curriculum to those outcomes; and a broad range of assessment measures such as student, alumni, and advisory board feedback,

common assignments and rubrics used by faculty, and field supervisor evaluations. The programs were each in various early stages of analyzing and responding to assessment data on specific outcomes. Assessment activities to date have pointed towards strategies for improvement as follows: CCV, strengthening career exploration opportunities and general updating of the core requirements for a degree in an increasingly specialized field; Castleton, strengthening students' skills in written communication and communication with supervisors; and Lyndon, development of a new "CIS Capstone" course to give students more experience in planning and analysis of project solutions. Specifically for Vermont Tech, the committee noted the potential value of working with outside assessment experts to develop assessments focused on student learning at various points during the program and not solely at the point of employment after graduation.

To ensure the sustainability of these assessment plans, the committee strongly recommended all programs adopt a multi-year cycle of assessment data collection and analysis, rather than attempting to cover assessments for all learning outcomes every year. Specifically for Castleton's program, which has slightly broader and more general learning outcomes, the committee recommended revising these outcomes to ones that would more specifically describe the core knowledge and skills of the computer information systems field, particularly programming.

### **III. Program Planning and Review**

All programs demonstrated commitment to continuous improvement in their summary reports of progress made from the recommendations of the 2012 PreCIP review. Highlights of this progress include the following:

CCV: created a comprehensive plan to embed assessment measures in courses; added course in project management as capstone experience option.

Castleton: added courses in programming based on student input.

Lyndon: revised curriculum into two focused tracks for improved marketing and alignment with Northern Essex CC partnership; increased curriculum emphasis on networking and security; and development of courses on portable technology programming and cloud computing.

Vermont Tech: developed CCV transfer pathway; expanded advisory board to out-of-state employers; completed Williston lab; and established summer programs for high school students at both campuses.

A theme highlighted in the committee's discussion was the critical need for ongoing program innovation and adaptation in this rapidly-changing field. The question was asked whether, due to capacity limitations, these programs in the VSC are simply in maintenance mode rather than creating and innovating. A top concern for the immediate future of CCV and Vermont Tech's programs, and within five years for Castleton's and Lyndon's programs, is the capacity to move to new industry standards for working in virtual environments. Other examples of capacity constraints discussed by the committee were CCV's curriculum committee

developing and sustaining assessment of direct evidence of student learning; Castleton's one full-time faculty member addressing needed curriculum development; Lyndon's faculty maintaining currency across all areas of the field; and Vermont Tech's hiring of sufficient faculty to support potential program enrollment growth. As a strategy to address curricular innovation and faculty capacity and expertise, the committee recommended to all programs the standardization of some shared core curriculum and development of a general "special topics" course to be taught in the format of a series of invited guest speakers with expertise in emerging content areas. The committee also recommended faculty work together across programs to distribute responsibility for maintaining expertise and innovating curriculum across diverse program areas. Finally, the committee identified ways that new partnership approaches with businesses for guest speakers, part-time faculty expertise, additional internship opportunities, and annual program advice (e.g. via an advisory council) could address some of these issues.

#### **IV. Continuous Improvement Plan**

The committee affirmed the individual programs' reported continuous improvement plans, with emphasis on the following recommendations.

CCV: design and implement direct (i.e. evidence produced directly by students) assessments of learning outcomes on a multi-year cycle; utilize webinars to communicate PreCIP results and future assessment plans to all program faculty; collaborate with Vermont Tech on utilization of simulation software for remote delivery.

Castleton: develop more specific learning outcomes for the program, with an emphasis on appropriate and identifiable skills (e.g. programming and/or projects) and potential alignment with national certifications and/or accreditation, and establish curriculum to support those outcomes.

Lyndon: continue work to refine curriculum with focus on two distinct program tracks, conduct assessment of revised learning outcomes 5 and 6, and plan for shift to virtual environments.

Vermont Tech: work with external assessment consultant to develop formative assessment strategies (i.e. within courses and/or early and mid-program points); expand collaborations with CCV to develop new degree pathways and remote access laboratories for online students.

#### Recommended Areas of Improvement for the VSC:

1. Support more frequent faculty collaboration across programs to share expertise, curriculum, and resources to maintain currency in emerging areas of the industry such as cybersecurity.

2. Support strategic transition of VTC and CCV, then Lyndon and Castleton programs to new industry standards for operating in virtual environments.
3. As a system, support cultivation of industry partnerships to sponsor summer internships, scholarship incentives, and/or part-time student employment.

## Natural Sciences – Geology Summary Report

CU Geology – PReCIP Summary 2017

**VSC Program Review and Continuous Improvement Plan (PReCIP):  
 Castleton University Bachelor of Sciences in Geology (BS.GEY)  
 Program Committee Report**

Program Review Committee for Natural Sciences - Geology

Nolan Atkins, Provost, Johnson State College and Lyndon State College, and Committee Facilitator

Helen Mango, Professor, Castleton

Charlotte Mehrstens, Professor of Geology, University of Vermont

The Program Review Committee met on September 14, 2017 to review the Program Review and Continuous Improvement Plan (PReCIP) report prepared by Professor Helen Mangrove for the Castleton University Geology program. A summary of the meeting and recommendations for continuous improvement follow.

**I. Program Overview & Enrollment History**

The Geology program within the Natural Sciences department does well to educate students in a manner consistent with the University’s mission:

“The university is dedicated to the intellectual and personal growth of students through excellence in teaching, close student-faculty interaction, numerous opportunities for outside-the-classroom learning, and an active and supportive campus community. Castleton strives to learn, use, and teach sustainable practices. The university prepares its graduates for meaningful careers; further academic pursuits; and engaged, environmentally responsible citizenship.”

The geology program provides a great deal of individual attention and ample opportunity for fieldwork and research opportunities with the two full-time faculty (1.5 FTE) who teach in the program. The quality of this experience reflects in the excellent retention of students within the department.

Enrollment and degrees granted since fall 2007 has been variable but relatively steady.

TERM	F07	F08	F09	F10	F11	F12	F13	F14	F15	F16
FTE	14.5	12.0	8.0	8.0	6.0	8.5	9.6	15.2	9.2	7.0
Acad Yr	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17
Degree Count	4	4	2	4	3	1	2	3	6	

These data are in line with national levels that show about 20% annual fluctuation. Nationally, few high school offer earth science so few students come to college intending to major in geology. Instead, they take introductory earth science courses and “get hooked”,



## CU Geology – PReCIP Summary 2017

transferring into the program. This is true for the CU geology program. It should also be noted that this is the only geology program in the Vermont State Colleges system (VSCs).

While not discussed in our meeting, the report notes that the Natural Sciences Department has recently submitted a large S-STEM (Scholarships in Science, Technology, Engineering, and Mathematics) grant to the National Science Foundation. If funded, this will allow the Natural Sciences Department to offer science scholarships to financially needy, but talented prospective students. The scholarships may be an effective recruitment tool, helping to bolster the incoming student numbers in the geology program.

## II. Assessment of Student Learning Outcomes

The Geology department is commended for their work in simplifying, reducing, and assessing the student learning outcomes. As a result of the recommendations of the last report and in working on the one subject to this review, the geology department has crafted five well-articulated student-learning outcomes (SLOs). They are:

1. Develop skills common to geologic professionals (e.g. comprehend and construct maps and use appropriate technological tools)
2. Develop an understanding of the physical constitution of the Earth (e.g. identify common rocks and minerals; describe the structure of the Earth and its major physiographic features)
3. Develop a general understanding of the internal and external dynamic processes of earth systems (e.g. understand plate tectonic theory, describe rock and hydrologic cycles).
4. Locate, assess and apply the scholarly work of scientists according to accepted practices.
5. Communicate scientific information, orally and in writing, according to accepted practices (e.g. technical writing and organization, with appropriate citations)

The department has chosen to focus initial assessment efforts on SLOs 4 and 5. SLOs 4 and 5 are assessed together in the required capstone course, Regional Geology. The report included the assessment rubric used to collect data on the SLOs. We commend the faculty for using this data to identify improvement areas. For example, with SLO#5, Dr. Mango indicates, “not all students can demonstrate that they can communicate scientific information in writing according to accepted practices.” During our meeting, Dr. Mango indicated that changes are being implemented to address the improvement areas such as the one previously mentioned.

Now that the assessment loop has been established for SLOs 4 and 5, the department is looking to begin assessment for SLOs 1-3. This will require the creation of assessment tools for data collection and identifying the appropriate courses within which to perform the assessment.

The Deans’ interview with students in the program can be summarized as follows. The students are glad to have chosen the geology major citing a challenging curriculum, ample experiential opportunities, closeness of the geology majors and faculty, and flexibility of the

## CU Geology – PReCIP Summary 2017

program given that most courses are offered on an every other year rotation. The students who are about to graduate felt like they were prepared for life after graduation.

The report did not include placement and continuing education data. Given the small size of the program, it is likely that the full-time faculty can track this information on recent graduates using social media such as Facebook and LinkedIn.

### **Recommendations Related to Assessment of Student Learning Outcomes:**

1. Reword SLOs 1-3 so that they are assessable and use active verbs such as “by the end of this course, students will be able to “identify”, “describe”, “calculate”, “predict”, etc.
2. Refine and better define, with examples, the categories that comprise the rubric to assess SLOs 4 and 5.
3. Create a curriculum map showing which courses in the geology curriculum address the five SLOs to ensure students are introduced to requisite content and skills in lower-level courses, reinforce them in intermediate courses, and move toward mastery of the SLOs in a capstone-like experience. Once complete, the SLOs that are addressed in the respective courses should be stated with explanatory language in the course syllabi.
4. Student poster presentations are a wonderful experience for the students, especially the public presentations (Natural Sciences and University-wide) of their research. The large format printer is supported by Natural Sciences but is without a budget line in the operating budget. The University should support this so that posters printed by faculty and students outside of the Natural Sciences are appropriately charge for usage.
5. In collaboration with the University Alumni office, track placement and continuing education data for recent graduates.

### **III. Program Planning and Review**

The report describes an annual meeting schedule that is indicative of a high-functioning department. The department meets once a month to address day-to-day and semester-by-semester issues (e.g., curriculum, scheduling, budgeting, etc.), three times a year to discuss program successes and areas of improvement, and annually to address larger programmatic issues and assessment. We commend the geology program for this ongoing commitment to ensure continuous improvement and commitment to the assessment process.

Throughout the report, it is clear that the geology faculty are attentive and committed to their students and curriculum. The program is a blend of a traditional geology degree with current relevant trends. An example of addressing a relevant geology trend is the recommended inclusion of a GIS course. Faculty regularly check alignment with other small, liberal arts colleges such as the University of Maine – Farmington, Keene State College, and SUNY Plattsburgh and private liberal arts institutions such as Williams College, Middlebury College, and Union College.

## CU Geology – PReCIP Summary 2017

In the context of program planning and review, the department is doing well to “close the assessment loop” for SLOs 4 and 5 by making adjustments in the Regional Geology course and in Hydrogeology. For example, Dr. Mango indicates that the assessment data show students “are not assessing and applying scholarly work to the extent that we feel is necessary. Location of scholarly work is not a problem – students demonstrate that they have learned how and where to access scholarly work. However, they do not cite these works in a consistent, accepted manner, and are not good at differentiating what is direct information from scholarly work and what is their own interpretation of this work.” These issues will be addressed the next time the capstone course, Regional Geology, is offered.

With regard to SLOs 1-3, the report indicates that assessment tools need to be developed. Therefore, no data has been collected to inform specific programmatic changes.

The full-time faculty who are teaching in the program are well-qualified to do so. There are 1.5 FTE dedicated to the geology program. Both faculty are active in their respective fields of expertise working on research that involves students, securing grant funding, and disseminating results through a variety of methods including conference presentations and peer-reviewed publications. Both faculty maintain currency through membership in national professional organizations in their field of expertise.

With respect to the adequacy of academic resources and support, the report highlights the need for the University to ensure that the van fleet is sufficient to meet the disparate needs across the institution. This is important for the geology program that takes students on many trips to engage in the experiential work that the discipline demands.

### **Program Improvements Resulting From the Last Review**

**1. Continue to recruit (and track the success of) promising students from large, introductory-level classes, connect students as much as possible to prospective employers, and track those who exit the program.**

The department continues to offer, at increased frequency, two introductory-level courses. Recruitment of majors from these courses has not had an impact on program enrollment. Due to changes in personnel within the Vermont Geological Survey, efforts to create a database of geologic consultants and other potential employers in Vermont has stalled.

**2. Insure that Admissions staff members are able to convey an up-to-date sense of the program.**

The geology faculty regularly meet with admissions staff to review understanding of the program and to update the “Geology One Sheet.”

**3. Simplify its assessment strategy by focusing on applications “in the field” and on a smaller number of the biggest ideas, developing indicators for them, revisiting them, and capturing evidence to gauge student proficiency.**

## CU Geology – PReCIP Summary 2017

As discussed earlier in this report, the faculty have focused assessment efforts on SLOs 4 and 5. Assessment of SLOs 1-3 will commence in the near future. The faculty have reduced the number of SLOs since the last review.

### **4. Emphasize, as resources permit, student acquisition of GIS skills.**

A GIS course is offered every year. Note that one of the recommendations resulting from this review is to require GIS in the geology program.

### **5. Explore ways to support and celebrate student scholarship and to make appropriate undergraduate research a program goal.**

CU geology students have presented their research work at multiple events on and off campus.

### **6. Hire a cross-disciplinary faculty member, shared with another science area, to enhance program offerings in surficial processes.**

While the University finances have not allowed hiring a full-time faculty member, the department has been able to hire a visiting faculty member for a period of 18 months. Until recently, the department has collaborated with Green Mountain College faculty.

## **Recommendations Related to Program Planning and Review:**

1. Given that 47 credits are required to complete the degree program, consider requiring a course in GIS. GIS on a resume will improve employment potential of graduates. It will have a positive impact on creating a scientifically literate citizenry. Expertise in GIS would be of use in town land use planning, conservation commissions, solid waste management, etc.
2. As the Department of Natural Sciences considers future full-time faculty hires, consider GIS as a requisite skill set so that GIS can be taught within the department on a regular basis.
3. Considering the emphasis of fieldwork in the program, the University should ensure that the quality and quantity of fleet vehicles is sufficient to meet the transportation needs.

## **IV. Continuous Improvement Plan**

The PReCIP process has been helpful to the geology faculty for many reasons; two are discussed here. First, it is evident that students practice synthesizing skills and content knowledge when they engage in independent research. Accordingly, the geology faculty are looking to incorporate more independent work in upper-level courses. Second, there is a need to help students develop scientific writing skills. This will be done in collaboration with the Writing Clinic within the Academic Support Center.

Based on this PReCIP review, the geology faculty have the following questions:

1. How do we know when an SLO has truly been achieved? And how do we know if continuing with current strategies will remain effective over time?

## CU Geology – PReCIP Summary 2017

2. How do we deal with the dwindling skills (particularly in writing, reading for content, and math) that our incoming students bring from high school?

The primary educational activity that will be added to the geology program to increase achievement of the SLOs is adding independent research to more courses.

The report contained a progressive program plan for continuous improvement that will guide the department through spring 2020. While it contains some information on improvement activities, it could include more detail on how SLOs 1-3 will be included in program assessment.

### **Recommendations Related to Continuous Improvement Plan:**

1. Within the progressive program plan for continuous improvement, include a plan to refine SLOs 1-3, develop assessment instruments, and use them to begin data collection.
2. Explore portfolio creation as an assessment tool.

VERMONT STATE COLLEGES  
BOARD OF TRUSTEES  
RESOLUTION

Commendation to Policy 101 Program Review Committees

- WHEREAS, In 2002 the Vermont State Colleges Board of Trustees approved a revised Policy 101, Review and Approval of Existing Academic Programs, to incorporate a VSC-wide review of degree programs by discipline; and
- WHEREAS, On April 28, 2011, the Board replaced its Review and Approval of Existing Academic Programs policy with a new Program Review and Continuous Improvement Process (“PRcIP”); and
- WHEREAS, The Policy 101 process calls for the establishment of cross-college committees to review program reports submitted by the colleges;
- WHEREAS, These committees include VSC faculty and staff and external representatives with strong backgrounds in the program area under review who voluntarily commit their time and expertise to the process; and
- WHEREAS, The Board of Trustees recognizes that these Policy 101 Program Committees play a critical role in the VSC program review process, particularly by making specific program improvement recommendations back to the colleges; and
- WHEREAS, The Board of Trustees appreciates the special role of the academic deans in managing the process, chairing the committees, and authoring the committee reports; therefore be it,
- RESOLVED, That the Board of Trustees commends the thoughtful and thorough work of the 2017 Policy 101 Program Review Committees, as attached, and particularly acknowledges the extra effort of the committee chairs, to support the purpose of Policy 101, to ensure that VSC colleges regularly engage in practices designed to foster the continuous improvement of programs.

## **2017 PreCIP Review Committees**

### **1. Agriculture and horticulture, including equine studies**

Facilitator: Deborah Stewart, Academic Dean, Community College of Vermont

Review Committee Members:

Jessica Stewart Riley, Associate Professor, Vermont Tech  
Marlys Eddy, Associate Professor, Vermont Tech  
Kim Crowe, Assistant Professor Vermont Tech  
Tracy Ostler, Executive Director, Green Mountain Horse Council  
Dr. Leonard Perry, retired faculty, UVM

Programs under review:

Vermont Tech: Equine Studies  
Vermont Tech: Landscape Design & Sustainable Horticulture  
Vermont Tech: Agriculture

### **2. Information technology and computing**

Facilitator: Yasmine Ziesler, Chief Academic Officer, VSCS Office of the Chancellor

Review Committee Members

Candace Lewis, Associate Academic Dean, CCV  
Jean Hakim, Professor, Vermont Tech  
Scott Hanselman, Assistant Professor, Castleton  
Dan Daley, Associate Professor, Lyndon  
Jim Hoag, retired faculty, Champlain College  
Steve Loyer, President and CEO, The Tech Group

Programs under review:

CCV: Computer Systems Management, Network Administration  
Vermont Tech: Information Technology, Software Engineering  
Castleton: Computer Information Systems  
Lyndon: Computer Information Systems

### **3. Environmental Sciences and STEM Studies**

Facilitator: Jonathan Spiro, Academic Dean, Castleton

Review Committee Members

Candace Lewis, Associate Academic Dean, CCV  
Andrew Vermilyea, Assistant Professor, Castleton  
Les Kanat, Professor, Johnson  
Ben Luce, Associate Professor, Lyndon  
Clare Ginger, Associate Professor, UVM Rubenstein School

Programs under review:

CCV: STEM Studies, Environmental Science  
Castleton: Environmental Science, Ecological Studies  
Johnson: Environmental Science  
Lyndon: Environmental Science, Natural Sciences, and Sustainability Studies

### **4. Natural Sciences - Geology**

Facilitator: Nolan Atkins, Provost, Johnson and Lyndon

Review Committee Members:

Helen Mango, Professor, Castleton  
Charlotte Mehrrens, Professor of Geology, University of Vermont  
Programs under review:  
Castleton: Geology

### **5. Outdoor Education/recreation/sports management**

Facilitator: Allan Rodgers, Interim Dean of Academic Affairs and Strategic Planning,  
Vermont Tech

Review Committee Members:

Mary Beth Lennox, Assistant Professor, Castleton  
Brad Moskowitz, Professor, Johnson  
Sean Doll, Assistant Professor, Lyndon  
Julia Muller, Consultant, 3 Fold Group  
Ted Teegarden, Director of Outdoor Education, White Mountain School

Programs under review:

Castleton: Sports Administration  
Johnson: Outdoor Education  
Lyndon: Mountain Recreation Management

### **6. Biology**

Facilitator: Phil Petty, Special Assistant to the Academic Dean, Vermont Tech

Review Committee Members:

Preston Garcia, Associate Professor, Castleton  
Elizabeth Dolci, Professor, Johnson  
Jeanne Harris, Associate Professor of Plant Biology, University of Vermont

Programs under review:

Castleton: Biology  
Johnson: Biology



## **VSC Program Review and Continuous Improvement Process**

### **Programs Under Review in 2018**

The following programs are identified for regularly scheduled PreCIP review in 2018:

Applied technology, including automotive technology, diesel power technology, fire science, and veterinary technology

- VTC AAS, Veterinary Technology (PreCIP exempt; externally accredited)
- VTC AAS, Automotive Technology (PreCIP exempt; externally accredited)
- VTC AAS, Diesel Power Technology
- VTC AAS, Fire Science

Spanish

- CSC BA, Spanish Language & Literature
- CSC BA, Spanish for Business

The following programs are recommended for a faculty mini-retreat focused on curriculum and assessment design strategies, to be scheduled no later than September 2018, with the next PreCIP review scheduled for 2023:

Atmospheric & Climate Sciences

- LSC BS, Atmospheric Sciences (pending NVU curriculum redesign)
- LSC BS, Climate Change Science (new program and pending NVU curriculum redesign)

Communication arts and sciences, including electronic journalism arts and graphic design

- CCV AA, Design and Media Studies (first year of redesigned program)
- CU AS and BS, Communication
- CU BA, Graphic Design (new program)
- JSC BA, Communications & Community Media (pending NVU curriculum redesign)
- LSC BA, Cinema Production (pending NVU curriculum redesign)
- LSC AS and BS, Electronic Journalism Arts (pending NVU curriculum redesign)
- LSC BFA, Graphic Design (pending NVU curriculum redesign)

English, literature, and writing

- CU BA, English
- JSC BA, English (pending NVU curriculum redesign)
- JSC BFA, Creative Writing (pending NVU curriculum redesign)
- LSC BA, English (pending NVU curriculum redesign)

**Item 4:**  
**Draft revision proposed for Policy 202**



## Manual of Policy and Procedures

Title <b>CRITERIA FOR THE CONTRACTING OF                  PART-TIME FACULTY AT THE                  COMMUNITY COLLEGE OF VERMONT</b>	Number 202	Page 1 of 2
	Date <u>T.B.D. 5/26/16</u>	

### PURPOSE

The Community College of Vermont (CCV) does not employ any full-time faculty. All instructors teaching for CCV are part-time, contracted on a per-course basis. This policy sets forth the criteria on which part-time faculty are contracted at CCV.

### STATEMENT OF POLICY

- A. Instructors contracted to teach at CCV on a per-course, part-time basis should meet or exceed the following criteria:
1. have some previous college or secondary school teaching experience, or relevant experience which has contributed to their ability to teach the particular course assigned;
  2. hold an earned masters degree or an acceptable substitute;
  3. hold a position within the community that demonstrates their leadership and expertise in the field in which they teach; and
  4. have knowledge of current trends and future directions of the profession, business or trade in which they teach.

Exceptional circumstances may occasionally require the employment of individuals who do not meet the minimum requirements listed above.

- B. No CCV instructor may be contracted to teach more than 11 credits for CCV (or across the VSC system as a whole) in any given semester.
- C. CCV will maintain the following information for all contracted part-time faculty:
1. evidence of qualifications for assignments or basis for exceptions;
  2. record of payment for services; and
  3. evidence of evaluation of performance by administrators and students.

Any activity or expense related to federal grants must comply with 2 *CFR* 200 – *Uniform Administrative Requirements, Cost principles, and Audit Requirements for Federal Awards*, in addition to the provisions above.

Signed by: \_\_\_\_\_  
Jeb Spaulding, Chancellor

**Item 5:**  
**Data: Student Credit Progress in the VSCS**

Student Credit Progress in the VSCS

<i>success/catch-up interventions: requires a clear year-by-year degree map and advising to leverage system resources</i>	<i>"auto" associate degree award?</i>	<i>"strong persists" study?</i>	<i>"on track" annual progress</i>
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**CASTLETON**

	<24 credits	24-30 credits	31-45 credits	46-60 credits	61-75 credits	76-90 credits	>90 credits	Total
<b>2014</b>	0%	0%	0%	3%	6%	23%	68%	100%
# of cohort students, enrolled in 10/15/17	1	0	1	7	14	53	158	234
Total original cohort								371
<b>2015</b>	1%	1%	7%	31%	54%	4%	2%	100%
# of cohort students, enrolled in 10/15/17	2	3	21	92	163	12	7	300
Total original cohort								443
<b>2016</b>	7%	29%	58%	3%	3%	0%	0%	100%
# of cohort students, enrolled in 10/15/17	27	110	222	11	10	0	1	381
Total original cohort								475

Cohort retention rate (within VSCS)	
Retained to 4th year	# Not retained
63%	137
Retained to 3rd year	
68%	143
Retained to 2nd year	
80%	94

**JOHNSON**

	<24 credits	24-30 credits	31-45 credits	46-60 credits	61-75 credits	76-90 credits	>90 credits	Total
<b>2014</b>	1%	0%	3%	3%	11%	36%	47%	100%
# of cohort students, enrolled in 10/15/17	1	0	4	3	13	43	56	120
Cohort size								219
<b>2015</b>	3%	4%	8%	40%	34%	5%	5%	100%
# of cohort students, enrolled in 10/15/17	3	5	9	46	39	6	6	114
Cohort size								204
<b>2016</b>	13%	38%	42%	4%	3%	1%	0%	100%
# of cohort students, enrolled in 10/15/17	20	60	67	6	5	1	0	159
Total original cohort								208

Cohort retention rate (within VSCS)	
Retained to 4th year	# Not retained
55%	99
Retained to 3rd year	
56%	90
Retained to 2nd year	
76%	49

Student Credit Progress in the VSCS

<b>LYNDON</b>		<24 credits	24-30 credits	31-45 credits	46-60 credits	61-75 credits	76-90 credits	>90 credits	Total	<b>Cohort retention rate (within VSCS)</b>	
<b>2014</b>		0%	1%	1%	8%	8%	23%	60%	100%	Retained to 4th year	# Not retained
# of cohort students, enrolled in 10/15/17		0	1	1	12	12	35	92	153	56%	118
Cohort size									271		
<b>2015</b>		2%	3%	9%	41%	32%	10%	3%	100%	Retained to 3rd year	
# of cohort students, enrolled in 10/15/17		3	4	14	64	51	16	5	157	59%	110
Cohort size									267		
<b>2016</b>		21%	40%	32%	6%	2%	0%	0%	100%	Retained to 2nd year	
# of cohort students, enrolled in 10/15/17		40	78	61	11	3	0	0	193	74%	68
Total original cohort									261		
<b>VERMONT TECH</b>		<24 credits	24-30 credits	31-45 credits	46-60 credits	61-75 credits	76-90 credits	>90 credits	Total	<b>Cohort retention rate (within VSCS)</b>	
<b>2014</b>		2%	0%	2%	2%	8%	21%	66%	100%	Retained to 4th year	# Not retained
# of cohort students, enrolled in 10/15/17		1	0	1	1	5	13	41	62	75%	21
Cohort size									83		
<b>2015</b>		1%	2%	17%	27%	40%	8%	5%	100%	Retained to 3rd year	
# of cohort students, enrolled in 10/15/17		1	2	17	28	41	8	5	102	48%	110
Cohort size									212		
<b>2016</b>		8%	17%	62%	7%	7%	0%	0%	100%	Retained to 2nd year	
# of cohort students, enrolled in 10/15/17		13	28	101	11	11	0	0	164	77%	49
Total original cohort									213		

Note: cohort is first-time, full-time, fall-semester starting students (traditional IPEDS measure).

**Item 6:**  
**Associate Degrees in the VSCS**



## Associate Degrees in the VSC

### General purpose degrees

CCV	Liberal Studies
CCV	STEM Studies
Castleton, Johnson, Lyndon	General Studies

### Specific AA/AS degree programs (typically 50% general education, 50% program courses)

CCV	Accounting
CCV	Administrative Management
CCV, Johnson, Lyndon, Castleton)	Business / Management
Lyndon	Cinema Production
Castleton	Communication
CCV, Vermont Tech	Computer Systems / Info Tech
CCV, Castleton, Lyndon	Criminal Justice
Vermont Tech	Civil Engineering Tech
Vermont Tech	Electrical Engineering Tech
Vermont Tech	Mechanical Engineering Tech
Lyndon	Electronic Journalism Arts
CCV	Environmental Science
Johnson	Fine Woodworking
CCV, Lyndon	Human Services
Johnson	Mathematics
Lyndon	Music Business and Industry
Vermont Tech	Nursing
Lyndon	Photography
Vermont Tech	Respiratory Therapy
Lyndon	Special Education
Vermont Tech	Software Engineering
Johnson	Technical Theater
Lyndon	Visual Arts

### Specific Associate of Applied Science (AAS) Degrees (typically 75% program courses, some embedded general ed)

CCV	Medical Assisting
Vermont Tech	Agribusiness
	Dairy Farm Management
	Landscape Design/Sustainable Hort.
	Applied Business Mgmt
	Entrepreneurship
	Construction Management
	Architec/Building Engineering Tech
	Equine Studies
	Fire Science
	Automotive Tech
	Diesel Power Tech
	Veterinary Tech

## Degrees Awarded by VSCS Colleges, by Level and CIP Category For Academic Year 2015-16

### Undergraduate Certificates

CIP Cat	CIP TITLE	CCV	CU	JSC	LSC	VTC	Total
11	Computer & Information Science & Support Services	1				1	2
19	Family and Consumer Sciences/Human Sciences	5					5
51	Health Professions and Related Programs	54				135	189
52	Business, Management, Marketing & Support Services	3		4			7
	<b>TOTAL</b>	<b>63</b>		<b>4</b>		<b>136</b>	<b>203</b>

### Associate Degrees

CIP Cat	CIP TITLE	CCV	CU	JSC	LSC	VTC	Total
01	Agriculture, AG Operations and Related Sciences					13	13
03	Natural Resources & Conservation	9					9
09	Communication, Journalism and Related Programs	3					3
10	Communications Technologies/Technicians & Support				5		5
11	Computer & Information Science & Support Services	25				2	27
13	Education	42			2		44
14	Engineering					4	4
15	Engineering Technologies & Engin. Related Fields	1				52	53
24	Liberal Arts/Sciences, General Studies & Humanities	194	3	4	1		202
41	Science Technologies/Technicians	10					10
43	Security, Law Enforcement and Protective Services	19				5	24
44	Public Administration and Social Service Professions	48			3		51
47	Mechanic and Repair Technologies/Technicians					28	28
50	Visual and Performing Arts	23		9	5		37
51	Health Professions and Related Programs	40	93			181	314
52	Business, Management, Marketing & Support Services	111	3	2	9	21	146
	<b>TOTAL</b>	<b>525</b>	<b>99</b>	<b>15</b>	<b>25</b>	<b>306</b>	<b>970</b>

**Item 7:**  
**“Start to Finish” Strategy Planning Draft**

12/1/2017 EPSL Update

## VSCS Start to Finish Initiative

Strategies	Goals and Metrics	Timeline and Responsibilities					
		Fall 2017	Spring 2018	Summer 2018	Fall 2018	Spring 2019	Summer 2019
<p><b>I. Launch messaging and advising campaigns to support increased enrollment intensity and for full-time students, successful completion of 30 credits per year.</b></p>	<p>Increase the number of students who complete 30 credits and other key momentum points (gateway courses, minimum GPA, 9 program credits) in their first year.</p>						
<p>"Think 30" messaging campaign</p>		<p>VSC faculty and staff attend Complete College America "Momentum" conference</p>	<p><i>Rollout of "VSCS Think 30" bookmark; plan individual strategies at each institution</i></p>				
<p>VSCS math pathways with coreq strategies</p>		<p>VSC faculty at CCA Momentum identify <b>math pathways</b> as priority project</p>	<p><i>develop project statement and identify funding and technical expertise resources to support</i></p>				
<p>Develop/refine degree structure, academic program maps, and momentum points to support advising</p>		<p>VSC faculty and staff at CCA-Momentum identify needs and potential models</p>	<p><i>potential focus of May 2018 VSC Academic Retreat</i></p>				
<p><b>II. Develop a chancellor's student success incentive or support scholarship</b></p>		<p>Review strategies and models in use elsewhere (Georgia State; U Maine; CUNY ASAP)</p>					

**III. Improve utilization of institutional research data and technology platforms, particularly the learning management system, to leverage real-time data to support student success**

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Technology: academic degree planning

**registrars test Ellucian Student Planning tool**

Technology: learning management system

"Teaching & Learning with Moodle" VSC Academic Retreat

Institutional research data

develop comprehensive (fulltime, part-time, new, transfer, year-round) cohort coding and data sets

draft metrics for Start to Finish goals

**IV. Develop VSC framework for alignment of individual college general education program requirements to support greater transparency for students who transfer or utilize courses from multiple institutions to catch up or accelerate academic progress**

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*develop VSC gen ed and associate degree (AD) framework*

Increase the number of students who are on track to complete an associate degree and/or progress to year 3 of a bachelor's degree program by the end of their second year.

**VSC registrars team develop starting framework**

*related potential initiative: establish spring sophomore advising and opt-in AA completion strategy*

**V. Increase visibility and use of Direct Admissions pathways**

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