COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 04-2

FOR NSF USE ONLY

NSF PROPOSAL NUMBER

FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)

GEO - GEOSCIENCE EDUCATION

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION
				066811191	

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)

SHOW PREVIOUS AWARD NO. IF THIS IS
☐ A RENEWAL
☐ AN ACCOMPLISHMENT-BASED RENEWAL

0122005

IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES ☐ NO ☐ IF YES, LIST ACRONYM(S)

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE

University of Vermont & State Agricultural College

AWARDEE ORGANIZATION CODE (IF KNOWN)

0036962000

ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE

University of Vermont & State Agricultural College
340 Waterman Building
Burlington, VT. 054050160

NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE

PERFORMING ORGANIZATION CODE (IF KNOWN)

ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE

IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)
☐ SMALL BUSINESS ☐ MINORITY BUSINESS
☐ FOR-PROFIT ORGANIZATION ☐ WOMAN-OWNED BUSINESS

☐ IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE

TITLE OF PROPOSED PROJECT **Looking Forward -- Scaling Up The Digital Image Archive of Landscape Change**

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
$ **13,970**	**0** months		

CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW

☐ BEGINNING INVESTIGATOR (GPG I.A)
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C)
☐ PROPRIETARY & PRIVILEGED INFORMATION (GPG I.B, II.C.1.d)
☐ HISTORIC PLACES (GPG II.C.2.j)
☐ SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.D.1)
☐ VERTEBRATE ANIMALS (GPG II.D.5) IACUC App. Date _____
☐ HUMAN SUBJECTS (GPG II.D.6)
Exemption Subsection _____ or IRB App. Date _____
☐ INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)
_____
☐ HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.E.1)

PI/PD DEPARTMENT
Department of Geology

PI/PD FAX NUMBER
802-656-0045

PI/PD POSTAL ADDRESS
Perkins Geology Hall

Burlington, VT 05405
United States

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
PI/PD NAME **Paul R Bierman**	**PhD**	**1993**	**802-656-4411**	**pbierman@zoo.uvm.edu**
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				

CERTIFICATION PAGE

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the individual applicant or the authorized official of the applicant institution is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding debarment and suspension, drug-free workplace, and lobbying activities (see below), as set forth in Grant Proposal Guide (GPG), NSF 04-2. Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

In addition, if the applicant institution employs more than fifty persons, the authorized official of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of Grant Policy Manual Section 510; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Drug Free Work Place Certification contained in Appendix C of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency? Yes ☐ No ☐

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Debarment and Suspension Certification contained in Appendix D of the Grant Proposal Guide.

Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding $100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding $150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, ''Disclosure of Lobbying Activities,'' in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME		

TELEPHONE NUMBER	ELECTRONIC MAIL ADDRESS	FAX NUMBER

*SUBMISSION OF SOCIAL SECURITY NUMBERS IS VOLUNTARY AND WILL NOT AFFECT THE ORGANIZATION'S ELIGIBILITY FOR AN AWARD. HOWEVER, THEY ARE AN INTEGRAL PART OF THE INFORMATION SYSTEM AND ASSIST IN PROCESSING THE PROPOSAL. SSN SOLICITED UNDER NSF ACT OF 1950, AS AMENDED.

PROJECT SUMMARY

REU Supplement for EAR- 0122005, *Landscape Change Project*

We seek NSF salary support for three undergraduate students to do primary research along with University of Vermont with faculty and staff for two months during the summer of 2004. These students will be part of the NSF-funded *Landscape Change Project*, a web-based initiative to gather, interpret and place on-line images that document changes in Vermont's landscape over the past century and a half. The students will be selected from University of Vermont majors in Geology, Environmental Science, and Natural Resources who have expressed an interest and aptitude in studying landscapes and how they change over time.

During their summer with the project, the students will find, scan, and document images of landscapes. They will go to the field to locate the sites from which the images were first taken, describe the changes that have taken place, and re-photograph the sites. Once this process is complete, they will enter these data into the on-line submission forms already created under NSF support. We anticipate that the students will attend the national Geological Society of America meeting in Denver (fall '04) to present their work professionally.

We have identified several specific projects that the students will pursue; we anticipate each student will select one or two projects for the summer and bring them to completion. A student might concentrate on studying and re-photographing early landscapes recorded in paintings and other realistic works of art. Many such images are held by the University of Vermont Fleming Art Museum and other museums in Vermont. Another student might analyze and re-photograph a series of panoramic images of Vermont held by the Library of Congress. Yet another might focus on collecting images of the 1927 flood, an exceptional geomorphic event in Vermont, the flood of record on most rivers in the state, and the cause of massive economic and cultural disturbance. One student will be responsible for systematically culling the image collections of three major university libraries in order to locate images of Vermont landscapes: the University of Vermont special collections, as well as the Dartmouth and the Middlebury College libraries. Perhaps a student will find it interesting to pursue, through imagery, the history of water-powered mills in Vermont. In the 1850s, there was a mill per few square kilometers in Vermont; their ponds trapped sediment derived from deforestation-catalyzed hillslope erosion.

During their time with the project, the students will gain a variety of skills. They will hone their abilities to work with research collections and learn to acquire high quality metadata for the images they select; they will gain experience working with town government officials and members of historical societies getting assistance in relocating image sites; in the field, they will be using GPS to gather location data as they attempt to find original photograph sites (an exercise in determining view angles and elevations), and they will gain practice in landscape analysis as they record descriptions of landscape change. Through all steps of the process, they will be using computer technology to scan images, optimize those images for web viewing, and input information into the web-hosted database that is the *Landscape Change Project*.

PROJECT JUSTIFICATION

Landscapes are one of the fundamental means through which humans interact with the Earth on a day-to-day basis. Over the past several hundred years, human interaction has dramatically changed the landscapes of eastern North America. Early images of the landscape were captured by artists in sketches and paintings (sup info, Fig. 1). After the popularization of photography in the 1800s, documentation of landscapes began in earnest (sup info, Fig. 2).

Four years ago, under NSF support, we began the *Landscape Change Project*, a web-based archive of historic images and modern re-photographs that documents human and naturally induced changes in the Vermont landscape over the last 150 years. The web site is **uvm.edu/perkins/landscape**

The project has involved high school and university students who scour archives for images of landscapes as they were in the past, relocate the spot from which the photographer stood, retake the image, and describe the changes to the landscape that have ensued over the decades (sup info, Fig. 3). This work is done in collaboration with UVM Professor Bierman, UVM staff member Massey, and an NSF-funded project coordinator, currently Jens Hilke, a naturalist. Bierman has 10 years of experience mentoring undergraduates including 5 who have obtained University honors for their research and 18 others who have done independent research.

We now have nearly 2000 images that document landscape change and under NSF support have recently developed a web-based interface for image submission greatly broadening the number and variety of people who can submit images to the project; version 2 is fully functional although we continue to iron out remaining formatting bugs daily. The database is growing as people around Vermont submit historical and modern images. We have presented our work at a number of conferences (e. g, Mallard et al., 2000; Massey et al., 2000, 2003; Persico et al., 2000).

Students have been involved in the *Landscape Change Project* since it began. University of Vermont undergraduates have collected images, collated them, and presented their findings quantifying landscape change at national geologic meetings (e.g., Persico et al., 2000). This fall, more than half the students in Bierman's geomorphology class collected historical images and posted them to the *Landscape Change Project* web site (sup info, Fig. 4). Last summer, a dozen students involved in the Governor's Institute of Vermont, a residential program for motivated Vermont high school students, collected and interpreted dozens of images at a local park that was once the residence of one of the richest families in Vermont. Their work, featured in an allied web site, **uvm.edu/oakledge,** documented massive landscape change as well as surprising stasis over the past 120 years (sup info, Fig. 5).

Rationale for REU Supplement -- We seek an REU supplement at this time because the *Landscape Change Project* provides an unusually rich venue for involving students in an on-going and active research program and because the time is right to build the *Landscape Change* database in ways that only several students dedicated to image acquisition and interpretation could do.

From a student perspective, the experience of working with the *Landscape Change Project* is valuable because they have the opportunity to master important skills (field observation, information technology) and because they learn geology, geography, and history working with the project. Working on the project, students become more intimately involved in the extended communities in which they live, an important aspect of the "place-based" educational philosophy that permeates much of what we do in the University of Vermont Geology department. Students in the project work closely with both faculty and staff.

The time is right to acquire large numbers of images. We have just completed the second version of our web-based image submission protocol that allows anyone to easily add images to the database, which builds web pages "on-the-fly" for display in response to search queries. Along with this effort, we have improved search capabilities by adding graphic, location-based searches to our existing text-based search engine. With three students working full-time over the

summer, we anticipate adding at least 50% and perhaps even doubling the size of the archive before funding from NSF concludes. We are actively seeking local foundation funding to continue the project next year. The more images and the more varied those images are geographically and topically, the more competitive our appeals for local funding will be; thus, supporting several undergraduates for the summer is a good investment in terms of helping to ensure continuation of the project after NSF funding concludes.

Work plan for REU Supplement -- We will begin the REU by recruiting students of the highest caliber from the ranks of University of Vermont undergraduates in such fields as geology, environmental science, geography, and natural resources. These students typically take several geology courses and will have the background necessary to do the work required. We will recruit using printed signage and email lists to offer summer involvement (with a competitive stipend) in the project. We will make a special effort to balance the group we recruit by gender and will attempt to solicit minority participation using mailings to faculty around campus and by contacting organizations on campus that support minority students. Our focus will be on students entering their junior and senior years with the hope that they will continue the work they start this coming summer as independent study projects or, if they are exceptionally well qualified, senior honors theses.

The students will initially work as a group with Professor Bierman, staff member Massey, and project coordinator Hilke so that they acquire the skill set necessary to do the project. They will learn how to use the project web pages to submit images and how to use the search routines to download images from the web. We have several Macintosh portable computers and scanners associated with the project. The students will learn the operating systems and programs needed to collect and optimize images. They will learn how to operate the GPS units and digital cameras that the project owns so that they can locate images in the field and re-photograph them.

After the initial orientation and sufficient practice to ensure that all three students are comfortable with both the technology and project philosophy, they will branch out on their own, although we expect that students will work together and with the project coordinator at different times over the summer. In particular, we imagine a week or two during which most of the group will travel together around Vermont locating and re-photographing images.

By the end of the summer, we expect that each student will have collected and posted to the archive database, hundred of images. Because re-photography is very time consuming, we recognize that not all images will be re-photographed but our goal is to re-photograph at least 30 or 40% of the images collected by the students.

We think that the summer experience will be most valuable for the students if it does not end in August. Thus, we seek limited funds to bring the students to the national Geological Society of America meeting in Denver so that they can present their work in at least one and perhaps several poster sessions.

We have identified several specific projects for the summer. We selected these projects because we know that extensive image collections exist, we have secured permission to use these collections, and the images in the collections are of interest to the general public who is served by our web site. Furthermore, all of the projects have the potential to develop into senior theses – a goal we have so that the summer REU experience becomes a catalyst to further learning. We anticipate that each student will select one project to call their own; other projects will be shared by students, as time permits.

Landscape change documented in paintings and drawings – Art, much of which was done decades before the advent of photography, is a landscape history resource we have just begun to examine and include in the database. For example, realistic landscape paintings done in the mid 1800s by Heyde depict the clear-cutting of Vermont and the landscape response of gully formation and erosion (sup info, Fig. 1). Many such paintings are held by the University of Vermont art museum and other museums in Vermont. One summer project will center on collecting, scanning, relocating, and

interpreting landscape changes recorded in paintings and other realistic works of art from before or just after the dawn of photography.

Systematic searching of university library and museum collections – The University of Vermont, as well as the Dartmouth and Middlebury College libraries, hold large collections of imagery. One student will be responsible for systematically searching these image collections order to locate and scan images of Vermont landscapes. During this process, we will collect all relevant metadata so that the scans we collect can be properly cataloged by librarians. Images found in the library collections and relevant to other student co-worker summer projects will be passed along to the appropriate students.

The biggest flood in Vermont's written history, 1927 – A student will focus on collecting images of the 1927 flood from as many towns as possible. This was an absolutely exceptional geomorphic event in Vermont, the flood of record on most rivers in the state, and the cause of massive economic and cultural disturbance; these images are distributed throughout the state in a variety of collections (sup info, Fig. 6). We will start the summer's work with library research and an attempt to relocate original copies of images published in several local histories of the flood (e.g., Minsinger, 2002). We have begun this flood work already with a junior geology major. This spring she is scanning, locating, and then re-photographing 90 images taken from the air in the days just after the flood. For an example, see (http://www.uvm.edu/perkins/landscape/LS_View.php?FileName=LS00493). These rare early air photographs are a wonderful resource for analyzing 75 years of landscape change since the flood.

Mills and Mill Ponds – Several Vermont geomorphology students, following the lead of Merritts and Walter (2003) in Pennsylvania, documented the extent of mills and mill ponds in Vermont during the 1850s using period maps (sup info, Fig. 7). These mills were used for sawing lumber, grinding grain, and processing textiles. Descriptions of damage to mills and the breaching of mill dams are common in accounts of the 1927 flood. Research in Pennsylvania suggests that detailed records of landscape response to colonial and post-colonial deforestation are preserved in the sediments impounded behind the now-breached mill dams. This project will focus on collecting images of mills, mill ponds, and mill dams both as they were when they operated and as they are today. The data collected in this project will be the foundation of later student studies of mill pond sediments.

Panoramic Images – The Library of Congress holds a series of several dozen panoramic photographs of Vermont landscapes (sup info, Fig. 8). Some of these very detailed images are of towns; many are of broad landscape vistas. All are available on the web in high resolution. We plan for a student to retake these panoramas using modern digital techniques that allow the stitching of several images to reproduce the original panoramas. We suspect there will be dramatic landscape changes illustrated in these panoramas.

REFERENCES CITED

Mallard, L.D., Massey, C.A., and Bierman, P.R., 2000, Vermont students gather digital images of human-induced landscape change, GSA Abstracts with Programs, 31 (7), A-421.

Massey, C., Hilke, J., and Bierman, P.R., 2003, Landscape metamorphism in Vermont: building an image archive of the past and present with students, historical societies, and towns. GSAAbstracts with Programs

Massey, C. A., Mallard, L. D., Bierman, P. R., 2000, Digital archive of human-induced landscape change with K-16 students in Vermont, GSA Abstracts with Programs, 32 (7), A-204.

Merritts, D. and Walter, R., 2003, Colonial mill ponds of Lancaster County, Pennsylvania as a major source of sediment pollution to the Susquehanna River and Chesapeake Bay, in "Channeling through time: Landscape evolution, land use change, and stream restoration in the lower Susquehanna Basin", Merritts, D. Walter, R. and de Wet, A., (eds), SE Friends of the Pleistocene Fall 2003 Guidebook, p. 48-55.

Minsinger, 2002, The 1927 flood in Vermont and New England, November3-7, 1927: an historical and pictorial summary. Blue Hill Meteorological Observatory publication.

Persico, L. P., Mallard, L. D., Bierman, P. R., and Massey, C. A., 2000, Forest to farmland and back again: a changing Vermont landscape: Geological Society of America Abstracts with Programs, 32 (7), A-24.

SUMMARY PROPOSAL BUDGET YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
University of Vermont & State Agricultural College

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Paul R Bierman

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Paul R Bierman - none**	**0.00**	**0.00**	**0.00**	$ **0**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	**0.00**	**0.00**	**0.00**	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	**0.00**	**0.00**	**0.00**	**0**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	**0.00**	**0.00**	**0.00**	**0**	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	**0.00**	**0.00**	**0.00**	**0**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**3**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**0**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**720**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**720**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**0**	
2. FOREIGN				**0**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **9,000**					
2. TRAVEL **2,000**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**11,000**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**0**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**0**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**0**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**11,720**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **student stipends only (Rate: 25.0000, Base: 9000)**					
TOTAL INDIRECT COSTS (F&A)				**2,250**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**13,970**	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **13,970**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Paul R Bierman

ORG. REP. NAME*

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
University of Vermont & State Agricultural College

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
Paul R Bierman

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **Paul R Bierman - none**	0.00	0.00	0.00	$ 0	$
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00	0	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL ASSOCIATES	0.00	0.00	0.00	0	
2. (**0**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00	0	
3. (**0**) GRADUATE STUDENTS				0	
4. (**3**) UNDERGRADUATE STUDENTS				0	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0	
6. (**0**) OTHER				0	
TOTAL SALARIES AND WAGES (A + B)				0	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				720	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				720	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				0	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				0	
2. FOREIGN				0	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **9,000**					
2. TRAVEL **2,000**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				11,000	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				0	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0	
3. CONSULTANT SERVICES				0	
4. COMPUTER SERVICES				0	
5. SUBAWARDS				0	
6. OTHER				0	
TOTAL OTHER DIRECT COSTS				0	
H. TOTAL DIRECT COSTS (A THROUGH G)				11,720	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				2,250	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				13,970	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)				0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ 13,970	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
Paul R Bierman

ORG. REP. NAME*

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Justification

Salary - The largest expense in this REU supplement is student stipends. We typically pay $1500/month for a full time student stipend and anticipate that each student will work two months between late May and the beginning of August. The university assigns benefits at a rate of 8% for temporary student summer employees.

Travel – In order to re-photograph sites and to meet with town officials and historical society members who routinely help us relocate images, we request mileage to cover the costs of students driving either their cars or University vans. In total, we anticipate driving several thousand miles, and so have requested $800. For travel to the GSA meeting, we have requested airfare for three students ($900) and their registration fees ($300).

REU SUPPLEMENT PROPOSAL

Proposal for Submission to the National Science Foundation

start date 3/1/2004

	Year 1 2004
Student Support	
Undergraduate student stipends *3 students, 2 months each* $1500/month	9000
TOTAL SALARY	*9000*
Benefits	
temporary student summer employee 8.00%	720
TOTAL BENEFITS	*720*
TRAVEL	
Travel to field sites by car or van	800
Travel to Professional meeting for 3 students	
airfare	900
registration	300
TOTAL TRAVEL	*2000*
TOTAL DIRECT COSTS	11720
TOTAL INDIRECT COSTS (salary only, 25%)	2250
TOTAL COSTS	13970

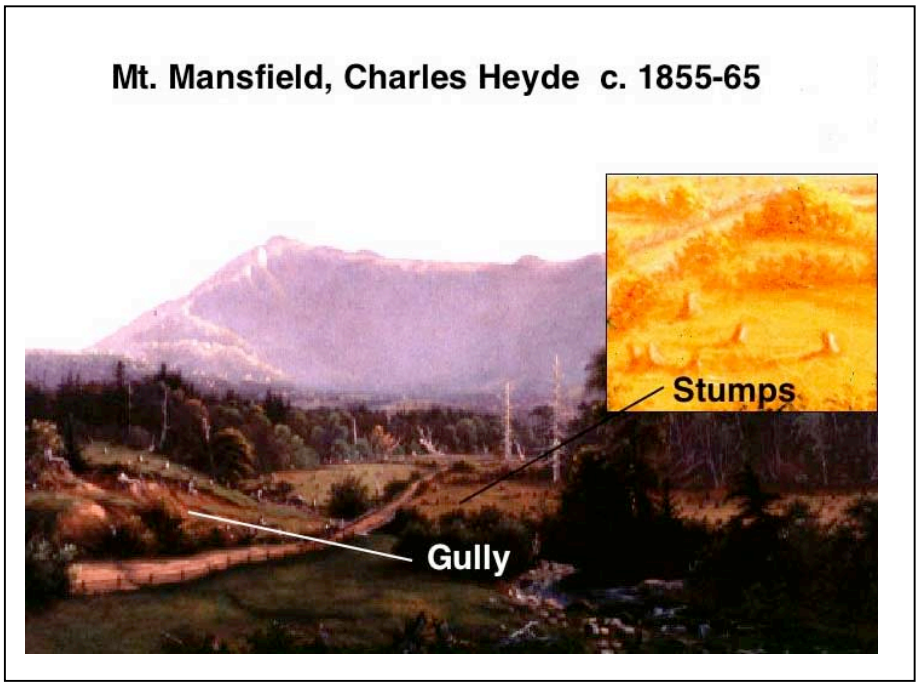

Figure 1. Painting of Mount Mansfield, northern Vermont, by Charles Heyde. View shows gully and stumps remaining after clear-cutting of the Brown's River flood plain. View looking east along what is now River Road in Underhill, Vermont. Mount Mansfield is the highest peak in Vermont. Image from the collection of the Fleming Museum, University of Vermont.

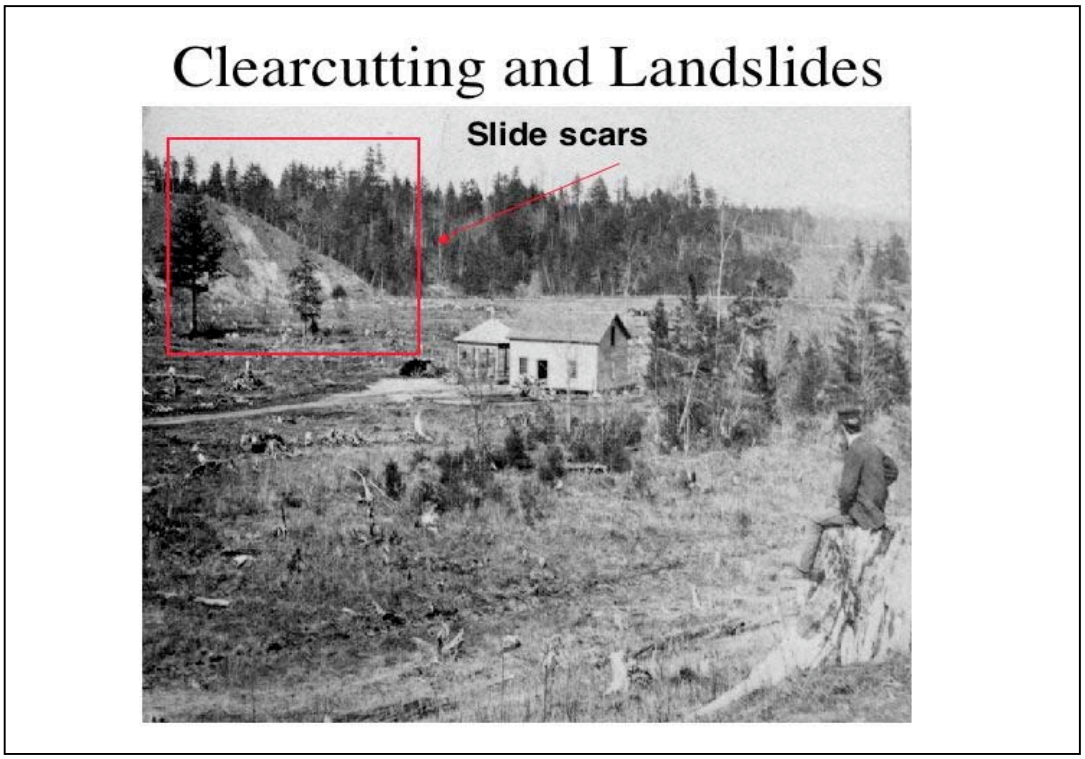

Figure 2 . Photograph from stereo-view card (1880s) shows clear-cutting and the resulting shallow landslides on distant hillslopes. Image used courtesy of Special Collections, Bailey Howe Library, University of Vermont.

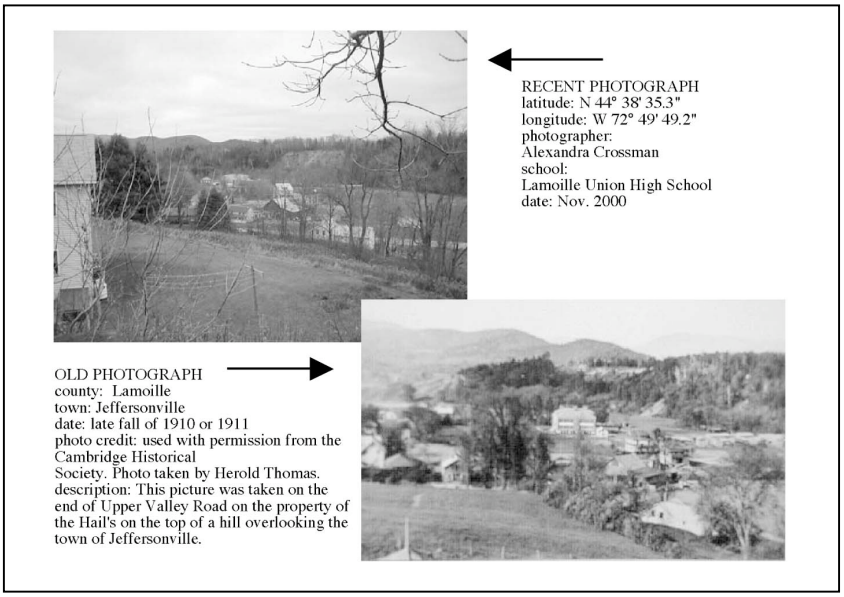

Figure 3. Image pair of photographs collected by high school student working with *Landscape Change Project*.

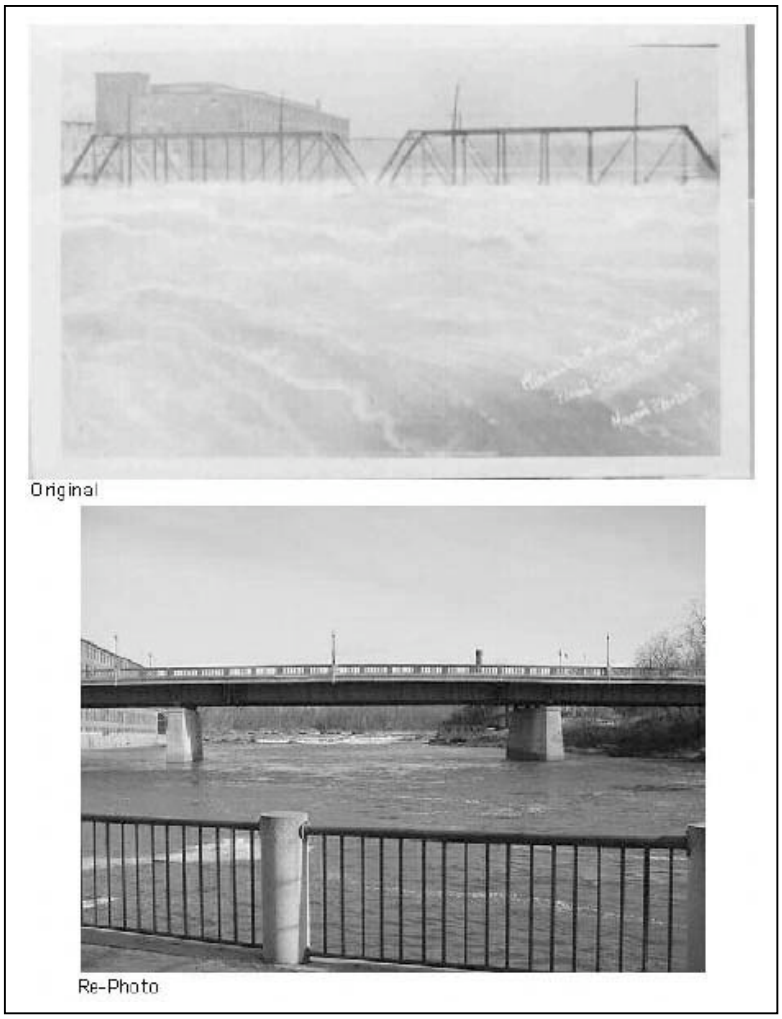

Figure 4. Paired images collected by students in 2003 University of Vermont geomorphology class. These images depict the flood of 1927 and a bridge near campus that was removed by the flood and later rebuilt.

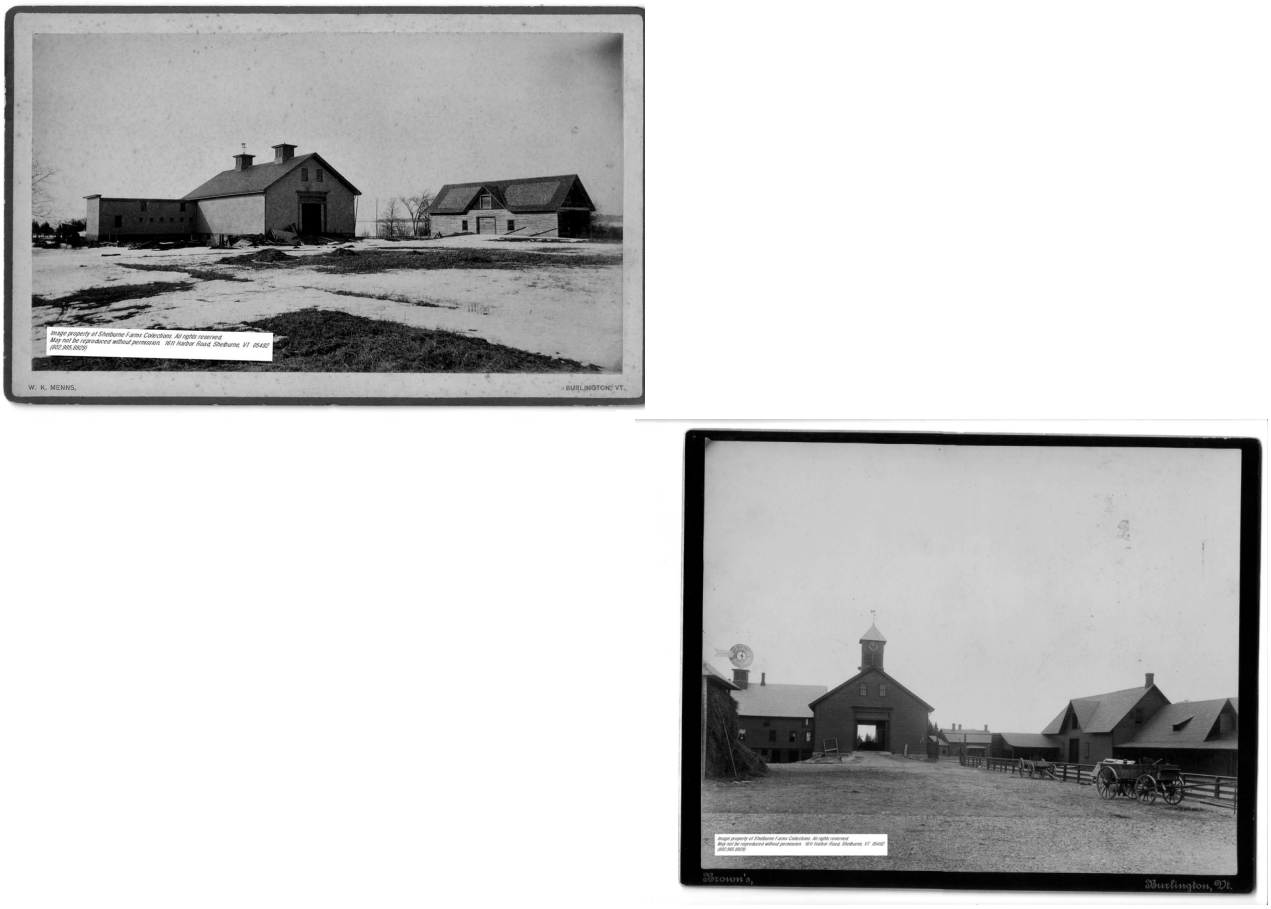

Figure 5. Images of same barnyard (1883, top) and (1886, bottom) scanned by Governor's Institute of Vermont students from the collection of Shelburne Farms. These barns were altered by the Webb family for use on their estate; numerous buildings were added connecting the barns thus sheltering the lake-side farm yard. Ornate cupolas were added to the main barn. The last remaining structure was bulldozed in 1975 to make way for condominiums and the city park.

Figure 6. Image of the 1927 flood inundating Main Street in Richford, Vermont. From University of Vermont, Bailey Howe library, Special Collections.

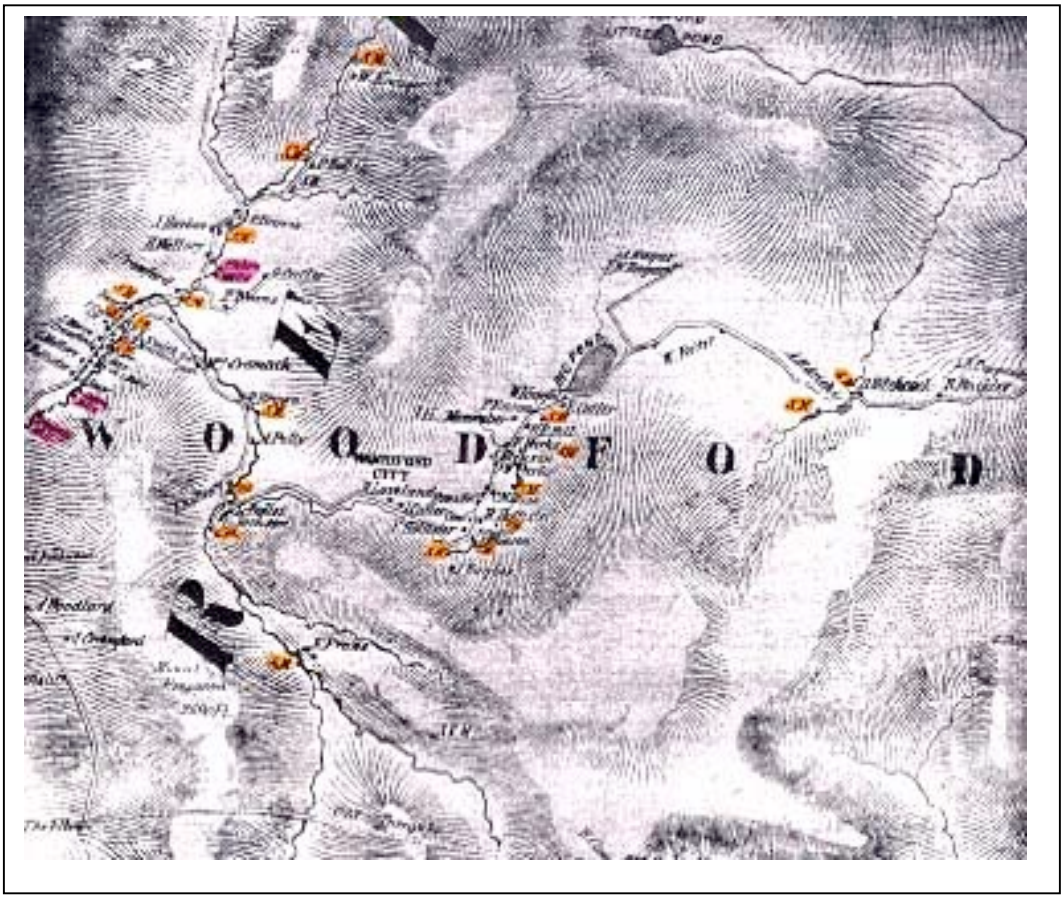

Figure 7. 1858 Wallings map on which students in the 2003 University of Vermont Geomorphology class have colored mills existing at that time; saw mills are orange; other mills are purple. Woodford, a hill town in the steep southern Green Mountains, had the highest concentration of mills in the towns studied, about 1 mill every 5 km^2.

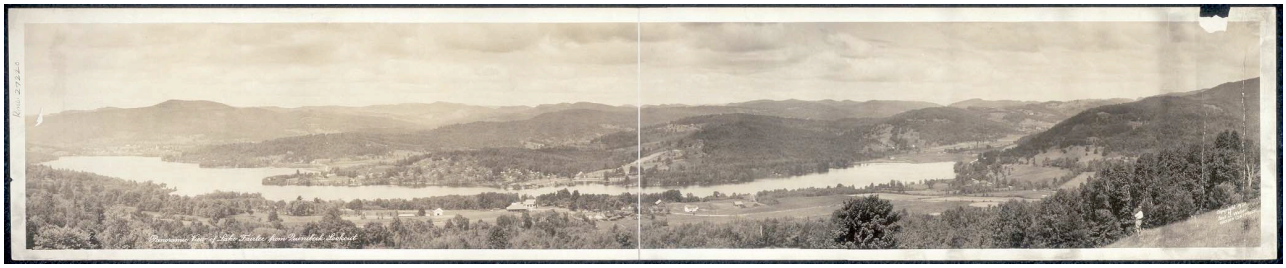

Figure 8. Panorama view of Lake Fairlee from Quinibeck Lookout (c. 1920) held by Library of Congress. From http://lcweb2.loc.gov/ammem/pnhtml/pnhome.html.