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Guest Essay

A RETROSPECTIVE ESSAY ON THE PUBLICATIONS OF THE New England - St. Lawrence Valley Geographical Society

by Timothy J. Rickard*
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Introduction

The mission of the New England-St. Lawrence Valley Geographical Society (NESTVAL) is to support geography and geographers in New England and the St. Lawrence Valley. Twice a year the region's representative reports to the Association of American Geographers (AAG) Council on the health of geography in the region and efforts to sustain the discipline. NESTVAL supports the geographic scholarship of individuals by offering them a forum at the regional meeting and in its publications. It seems appropriate in this inaugural volume of *The Northeastern Geographer* to consider the evolution of the Society's publications in meeting the changing concerns of the discipline and of practicing geographers from the earliest days of NESTVAL to the present.

The Beginnings of NESTVAL

The first meeting of the New England Geographical Conference took place at Clark University in 1922 (Meeks 1975). At subsequent meetings, mainly at Clark under the leadership of Wallace Atwood, the emphasis was on teaching geography. Distinguished geographers based at America's most prestigious institutions met with schoolteachers and faculty at teacher training institutions to promote the discipline. The job of state representative was to organize teachers at colleges and schools: Yale's Ellsworth Huntington was Connecticut's State Representative at one time. The Conference became an AAG division in 1952, added the St. Lawrence Valley in 1954, and adopted the present name in 1956. Between 1952 and 1971, according to Hal Meeks (1975), the Society isolated itself increasingly from schoolteachers. Three decades later, despite repeated efforts, the means have not been found to attract this constituency. In retrospect, it seems that state and province representatives on the NESTVAL Executive Committee should maintain a liaison role to the region's teacher alliances.

The NESTVAL Newsletter

The first *Newsletter* appeared in 1949. An annual roundup of reports about people, departments and meetings, the *Newsletter* has kept the membership informed since then. The 60 years of *Newsletters* are also the Society's most important archival resource. Until the mid 1980's the NESTVAL archives were housed at Clark University under the supervision of Bill Koelsch but this arrangement faded away during the 1980's. The Society needs to re-establish a formal

archive where scholars can retrieve the records of its history including publications and the programs of its meetings. This should be maintained in a volunteer department or by the AAG. Collecting information electronically for the *Newsletter* and distributing it electronically means far less work for the editor than formerly and the *Newsletter* could be a biannual publication, as in the 1970's. Paradoxically, at the time of writing, the last *Newsletter* was the 2006 edition. The embryo NESTVAL website does not replace the *Newsletter* but should include and supplement it.

The Proceedings

The first *Proceedings* of the Society was published in 1972 as a joint publication with the Middle States Division of the AAG recording the scholarship presented at the 1971 meeting at Columbia University. In the 1976 *Proceedings*, Richard Riess (Salem State College), the first Editor, recalled that a motion for the publication of an annual journal was defeated at the 1966 annual meeting. Further discussion in following years resulted in the establishment of a proceedings rather than a regional journal. The intent was to encourage the presentation of papers at the annual meetings by promising the publication of good quality manuscripts. Before 1971, seldom were as many as a dozen papers presented at the Annual Meeting. The results of the new publication were gratifying, Riess said, in quality and quantity. In 1971, Riess received thirteen manuscripts and published eleven in full. These numbers increased during his editorship so that he received 40 manuscripts for the 1976 Proceedings and published 28 in full (Riess 1976). The major problem was the cost overrun and time delay of professional printing which involved typesetting at that time.

When I became editor in 1977 I knew that the meager budget precluded using a commercial printing house and was painfully aware of dire consequences should I fail to deliver the 1977 Proceedings at the 1978 meeting. I avoided disgrace by having the manuscript typed onto special plates and printed in the Anthropology Department at Central Connecticut State University (CCSU) and by stapling and trimming the copies myself in the university's print shop in the hours before leaving for the meeting. Subsequent technological advances made printing much easier but editing took time even without peer review. I was greatly helped by John Harmon (Assistant Editor: CCSU) and by David Frost and Max Barlow of Concordia University. Over much of the past 30 years, lower printing costs in Quebec helped the Proceedings stay within budget.

One characteristic of the early years of the *Proceedings* was editorial continuity. Dick Riess served for six years and I was responsible for eight annual publications. Lately, it has been the Society's practice for the editor to be one of the organizers of the annual meeting. Inaugurating *The Northeastern Geographer* is intended to restore editorial continuity. During the 1970's and 1980's some 25 to 30 libraries in and outside the region placed standing orders for the *Proceedings*. These have dwindled away. The revenue was useful but accessibility to the scholarship a more important policy consideration then and now. Throughout the life of the *Proceedings* articles on a full range of regional topics formed roughly half the content of most volumes. These would constitute a thick but highly disparate compendium on the geography of the region.

AAG regional divisions and their regional journals today emphasize scholarship on their region which is the logical place for students and faculty seeking to apply methodology.

In an editorial report in the 1988 *Newsletter*, Max Barlow, the *Proceedings* Editor, complained that fewer than half of those presenting papers at the annual meeting were submitting them for publication. Nevertheless, the *Proceedings* contained about a dozen articles throughout the 1990's when a series of capable editors maintained the standards. At the beginning of the next decade, however, it became clear that NESTVAL needed a journal rather than a proceedings.

Special Publications: *Geography in New England*

In 1988, the Society published *Geography in New England*, a collection of departmental histories, transcripts of interviews in Wes Dow's *Geographers on Film* series, and papers on the emergence and status of applied geography in New England (Harmon and Rickard 1988). Institutional histories included Yale University, Dartmouth College, Mount Holyoke College, Salem State College, Clark University and Harvard University. The New England geographers interviewed were Ella Keene, Rowland Illick, Peter Nash, George Lewis, Saul Cohen, Edward Miles and Geoffrey Martin. The book, conceived by the *Proceedings* editors and resulting from special sessions at the annual meeting, remains the sole special publication of the Society.

The book is a useful archive. The editors of *The Northeastern Geographer* and the NESTVAL Executive Committee should contemplate a companion volume: there are other departments and a new generation of geographers. Equally important, geographic information science has transformed many departments in the past two decades as did applied geography previously. These departmental evolutions need recording and evaluation.

The Origins of *The Northeastern Geographer*

After several years of discussion, a motion to establish a regional journal to replace the *Proceedings* was passed by members present at the 2006 NESTVAL Business Meeting at Burlington, Vermont. The Society believed that a peer-reviewed journal was needed as an outlet for members' scholarship. It was also felt that a journal, rather than a proceedings, would better serve the needs of graduate students and younger faculty members still seeking tenure or promotion. By 2006, the *Proceedings* was failing to attract sufficient papers and editorial responsibilities were falling by default on the conference organizers. For example, at the Hartford meeting in 2003 participants made more than 50 presentations but eight papers and three reports were published. The program chair became temporary editor. Lack of editorial commitment and continuity was viewed as a problem in attracting quality papers and the timely publication of the *Proceedings*.

At that time, the Executive Committee and particularly Cathleen McAnneny (University of Maine-Farmington) as NESTVAL President investigated the highly regarded *Southeastern Geographer* as a model regional journal. The resulting resolution called for maintaining the

tradition of an annual publication rather than the biannual commitment of the *Southeastern Geographer*, recognizing the role of a regional journal for stimulating scholarship at the annual meeting. It called for an editor and associate editor appointed for a renewable two-year term and supported by an advisory board of their choice. Recognizing the Southeastern Division of the AAG's strong record of scholarship on their region, the resolution committed the new NESTVAL journal to support research on New England and Quebec. It would publish reviews of books on the region or by geographers in the region. The editors, and advisory board, would disseminate the journal by obtaining standing orders from libraries within the region. The call for applications suggested that the editors were expected to put their own stamp on the journal. Now we have the results of the resolution and the editors' labors in our hands.

NESTVAL's Future Tasks

In this essay I have asserted that NESTVAL must sustain the tradition of an annual newsletter and an annual journal, now *The Northeastern Geographer*. Furthermore, the journal editors, in conjunction with the Executive Committee and prospective hosts of annual meetings, should plan a special publication on one of several topics as a book or special edition. Newsletters and session titles record NESTVAL's recent preoccupation with international education, reflecting institutional missions and AAG encouragement. Departmental provision of long and short term opportunities for student study and research abroad has often been innovative, judging from the presentations. One example is the partnership between CCSU, Bridgewater State and two Brazilian universities. Manuscripts on these programmatic innovations in the practice of geography in the region have been sparse and a special edition of *The Northeastern Geographer* would be timely.

Support from the elected NESTVAL leadership and the concern of the membership at large is essential for those editorial volunteers who assume responsibility for quality and timely publications and information. I sense that this millennium has seen a further globalization of perspective among the region's geographers who now have easy access to conferences and publications in their specialty all over the world. New leadership must strengthen the services which support geography at its grass roots in the region.

In my opinion, the discipline is no stronger overall in the region than when I arrived in 1971. A few medium sized departments, including my own, are stronger. Most of the larger and more prestigious departments have held their prominence nationally. Geography has been vulnerable, however, when partnered with other disciplines in a small or medium sized unit. The stand alone geographer always needs support. Half a dozen single geographer departments of the 1970's and 1980's no longer have the discipline as a major at their institutions. Sadly, geography has virtually disappeared from higher education in Rhode Island: geographers from the University of Rhode Island and Rhode Island College were prominent in NESTVAL in the 1970's and 1980's. There is now no Masters degree in geography in the three states of northern New England.

The AAG Council expects the Society to nurture geography in the region: the Councilor's one fixed responsibility is a semi-annual report on the health of geography. The NESTVAL

Executive Committee is working hard to fend off attacks on departments and to promote the discipline. Annual meetings are still well attended. Both undergraduate and graduate attendance has increased considerably, thanks to the excellent Geography Bowl, the reintroduction of student prizes and the encouragement for students to practice their professional craft. And now, with its new annual journal, NESTVAL is committing itself to promoting and showcasing the scholarship of its members and others who research this diverse and ever-changing region. The inaugural volume of *The Northeastern Geographer* is thus an important milestone in the evolution of NESTVAL. NESTVAL and the editors of *The Northeastern Geographer* are dedicated to producing a peer-reviewed journal of the highest quality. The success of this venture is also dependent upon the support and commitment of NESTVAL members and scholars devoted to the study of the Northeast and St. Lawrence Valley regions. Let's give them all our support!

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THE VIEW FROM NEW HAVEN:
Timothy Dwight's Urbanism, 1796 - 1817

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ABSTRACT

Agrarian republicanism of the early National Period was suspicious of cities and manufacturing. The historical geography and politics of New England, however, were more receptive to urbanization and industrialization. This paper examines the *Travels* of Timothy Dwight, President of Yale and *de facto* leader of the old order in Connecticut. His text expresses a distinct, Federalist, landscape ideal. I examine Dwight's integration of urbanism and manufacturing into a conservative symbolic landscape, noting four themes: moralizing ideals of urban morphology; the social benefits and challenges of urban size; the projection of a rural model of elite patronage into urban space and city-making; and an affirmative reading of the growth of manufacturing and its centripetal concentration in cities. *Keywords: Timothy Dwight, symbolic landscape, federalist, urbanism.*

Introduction

Agrarian republicanism has been thoroughly inscribed by popular wisdom and by generations of historians as the lost Eden of American national identity. It imagined a world - and more specifically a *landscape* - where freehold land ownership and the labor of improvement guaranteed independence, morality, responsibility, and every manner of civic virtue. The idea was clearly expressed by Thomas Jefferson in what must be the founding quotation of American urban studies:

> I view great cities as pestilential to the morals, the health and the liberties of man. True, they nourish some of the elegant arts, but the useful ones can thrive elsewhere, and less perfection in the others, with more health, virtue and freedom, would be my choice. (Thomas Jefferson to Benjamin Rush, 23 September 1800).[1]

The idea is implicit in a Constitution in which the word "city" does not appear, and it enters in different forms into American thought throughout the nineteenth century: for example in Emerson's agrarianism, in Thoreau's anti-urbanism, in the idea of the frontier itself, and in the spiritualization of the wilderness in the graphic arts (e.g, Eisinger 1949; John 2004; Smith 1950; Stenerson 1953; Turner 1962). Jefferson expressed a similar animus against manufacturing

which, until it was tempered by the exigencies of protectionism in the War of 1812, was at least as low as his opinion of cities themselves.

> I consider the class of artificers [i.e., manufacturers] as the panders of vice and the instruments by which the liberties of a country are generally overturned. (Thomas Jefferson to John Jay, 23 August 1785).

To recover for cities and industries their appropriate place in this mythic landscape is a task that has occupied many historical geographers and historians. Donald Meinig's (1993) *The Shaping of America* is undoubtedly the most far-ranging geographical demonstration of the historical interweavings of town and country, while Richard Wade (1959) portrays towns as the very "spearhead of the frontier," usually developing at least in embryo even before serious clearing began. And when they arrived, farmers were not rooted in place by fee-simple tenure as Jeffersonian pillars of a local moral community. Use value ineluctably gave way to exchange value as land speculation, integration with growing markets, resource exploitation, and labor mobility progressed. Despite the variety of perspectives on American historical geography of the colonial period (e.g., Jordan 1989), many agree in finding burgeoning individualism and enthusiasm for profit and self-advancement in the seventeenth and certainly by the eighteenth century, (Lemon 1972; Mitchell 1983). Soon "millions of [Jefferson's] agrarian worshipers flocked to urban centers or worked to transform their own rural hamlets into cities" (Brown 1974, 30). A host of more regionally and historically specific studies have explored the local complexities of urbanism and manufacturing, their relationship to natural resources and ideology, and their place in the historical geography of capitalist development (e.g.,, Colten *et al*. 2003; Lemon 1996; Mitchell and Hofstra 1995; Prude 1983). Scholars of the "landscape" school in cultural geography have also explored agrarian republicanism as an ideological construct, suggesting its relation to class, proprietorship, and politics (e.g.,, Cosgrove 1984; Mitchell 2000; Olwig 2002).

Jefferson's native state was, indeed, one with little apparent need for cities, thanks to the distinctive long-distance trading ties of Virginia planters, the nonurban context of the Anglican congregation, and the function of the plantation itself as a surrogate for cities (e.g., Reps 1965). The world of colonial and early national New England was very different. Cities were present from the first in the commercial and cultural ideals of the Puritans and of their successors in the Federalist and Congregationalist elite. The ingenuity and artifice required in manufacturing were even affirmed in the eschatology of the age. Perhaps the most acclaimed sermons in the generation before Dwight were those of Samuel Hopkins (1721-1803), who celebrated and anticipated great improvements in the "mechanic arts" in his vision of the Millennium (Hopkins 1811, 467). After the Revolution urbanization took on new vigor as capital flows to Britain were redirected internally and protectionism nurtured American manufacturing. Texts of the time are full of ideological readings, reactions, and rationalizations of the new landscapes these trends were producing.

I have argued in previous work (Pipkin 2009) that Timothy Dwight's *Travels in New England and New York* (1821-22) is a text which is exceptionally revealing of landscape ideologies of the early national period. Dwight was President of Yale from 1795 until his death in 1817.

A distinguished theologian, polemicist, preacher, and Federalist ideologue, he was arguably the most influential figure in Connecticut for two decades. His four volume *Travels* comprise an extraordinary compendium, assembled at a time when wide-ranging, comparative, first-hand topographical accounts of the new national landscape were literally thin on the ground. *Travels* takes the form of letters to a hypothetical English correspondent. The text was developed from notes accumulated on trips almost every September and October from 1796 until 1815. They combine personal observation, interpretation of local historical records, portraits of local gentry, economic inventories, and agricultural lore, with brutally simplistic accounts of wars with the "savages" and the French. They juxtapose perceptive geological, agricultural, and botanical observations with incessant moralizing judgments.

Dwight's preeminence in Connecticut was both political and religious. Indeed these dimensions were inseparable in an era when the "Standing Order" of an established church guided most areas of collective life. Connecticut's entrenched elite feared the diversity, irreligion, and diffusion of the franchise that were being inspired, they felt, by Democratic-Republicanism, Thomas Jefferson, Jacobins, Deists, freethinkers and atheists (Berk 1974; Fitzmier 1998; Grasso 1999; Howard 1943; Silverman 1969; Wells 2002). Jefferson wrote of this self-perpetuating oligarchy in his *Memoirs*:

> From what I have seen of Massachusetts and Connecticut ... there seems to be in those two states a traditionary reverence for certain families, which has rendered the offices of government nearly hereditary ... although this hereditary succession to office ... may in some degree be founded in real family merit, yet in a much higher degree it has proceeded from [the] strict alliance of Church and State. ... In Virginia, we have nothing of this. (Thomas Jefferson to John Adams, 28 October 1813).

In Pipkin (2009) I explored several aspects of Dwight's reading of the landscape organized around the idea of "aesthetic discipline." Dwight's anxieties about the progress of populist democracy, irreligion, and the manifold political threats to the hegemony of the old order in Connecticut led him to seek – and rhetorically impose – discipline and order in a post-Revolutionary landscape that was alive with settlement, land-clearance, migration, and political and economic innovation. He did this, I suggested, by reading the aesthetics of landscapes as signs of moral order and social virtue. Dwight deployed eighteenth century neoclassical aesthetics of landscape and architecture (e.g., "sublime," "picturesque," "classical") and newer ideas of refinement and sentiment (e.g., Bushman 1993), to moralize landscapes and find symbolic order (e.g., Briggs 1988). He does so using several tropes including visual framing of compact villages using language of the picturesque, and detecting the diffusion of good moral influence across rural areas from the "seats" of gentry, whose cultivated scenery and "prospects" he describes in the aesthetic vocabulary of the neoclassical pastoral. He was concerned, above all, to inscribe the northeast as a greater New England, attentively tracking and celebrating the progress of New England settlement in the "wild west" (of upstate New York) and the "wild east" (equally wild tracts of Vermont, New Hampshire, and Maine), anxiously noting the:

> [S]ettlements made by the people of New England ... the wilderness converted by

> them into fruitful fields ... numerous, cheerful, and beautiful towns and villages which under their forming hand have sprung up in a desert (Dwight 1969, 1: 122). [2]

I argued in the work outlined above that in Dwight's writings we may discern the elements of a Federalist landscape ideal to set against the norm of agrarian republicanism which long ago attained mythic status (e.g., Griswold 1946). The purpose of the present paper is to take this argument further in an exploration of Dwight's conceptions of *urbanism* and *industry*. These phenomena were central to a specifically Federalist world view and both were viewed with suspicion by Jefferson and his allies.

In attending closely to a single source, particularly such a tendentious one as Dwight, one is apt to compound the subject's overt biases with the researcher's inadvertent ones. In the following I have read *Travels* closely for its account of cities, urban society, and industry. The result is a necessarily partial, though I hope not partisan, reading of an author in whose empirical descriptions and partisan special pleading can be discerned a landscape and a landscape ideology distinctive to the Federalist northeast.

Augustan Balance and the Federalist Ideal

Federalists in the early national period were less insistent than Jefferson on the unique association of farming and virtue, and were less convinced that cities were inherently corrupting (Stenerson 1953). They affirmed the roles of centralized government, banking, and the orderly growth of commerce and manufacturing, all under the guidance of elite leadership, who would hold in check the "brawling and boorish tendencies" of revolutionaries and mobs (Wood 1990, 203). Beyond the economic and political aspects of their worldview lay a distinct cultural ideal, one that Gordon Wood underlines with the telling phrase "the Federalist Augustan Age." It was a literary view deriving from classical antiquity filtered through neoclassical English culture of the first half of the eighteenth century, the world of Addison and Pope, and its successor, the Augustan Age dominated by such figures as Samuel Johnson. Georgian England held out a model of society in which city and country were *in balance*. On one hand, landed property was the primary repository of wealth and political power. It was owned by a small minority, familiar in the culture of the time as city-based Tories and their opponents in the Whiggish rural gentry. On the other hand, cities enjoyed a cultural monopoly of representations of power, commerce, and refinement.

Thus Samuel Johnson famously maintained in 1777 that when one was tired of London one was tired of life. Dwight knew Johnson's work well and was aware of his contempt for the American colonials (and their position on taxation and representation). Nevertheless, Johnson's influence is visible at many points in the *Travels*. Significantly, the most extended quotation from Johnson that Dwight uses is from Johnson's satirical poem *London*. It is an aspersion against the French ("the supple Gaul was born a parasite...") which Dwight uses to reinforce his position against Francophile Jeffersonian Republicans. Dwight maintains that the English colonists were "better skilled in the arts of life, were better educated, had better morals and a better religion, and were in every respect a superior race of men" than the French (Dwight 1969, 1: 108-109).

The quotation underscores Dwight's hatred of democracy, Jacobinism, Deism, abstract speculative thought, and all other dangerous cultural innovation emanating from Monticello and Paris, but it also suggests his positive leanings to Augustan urbanism.

An Augustan balance between town and country, which classically educated contemporaries would have expressed as the contrast between Virgil's *Aeniad* and his *Georgics*, was strongly reflected in the elite-sponsored visual arts at exactly the moment when it began to break down in the face of new forms of capitalism (Cosgrove 1984). The devastation wrought by this transition, largely mystified in paintings, is seen more clearly in the oppositional and dispersed forms of literary representation such as Oliver Goldsmith's *Deserted Village* of 1770 (Dobson 1906). For Dwight the Greco-Roman heritage as filtered through the neoclassical values of Augustan England – and specifically the balance it posited between the urban and rural – was congenial. Despite his carefully phrased Calvinist objections to classical paganism, slavery, imperialism, and "opulence," he was after all an eminently successful product of a classical education. The fanatical regimen of self-discipline that Dwight imposed on himself while he was a tutor at Yale involved parsing one hundred lines of Homer first thing every morning, distant echoes of a society in which "city"' and "state" were politically and linguistically identical (Silverman 1969, 19).

But the classics were not the only pro-urban stream in Dwight's consciousness. For he was the grandson of the great Puritan theologian Jonathan Edwards and was an intellectual and political descendent of John Winthrop himself. In a milder, gentler, but no less sectarian form, Winthrop's City on a Hill lives on in Dwight's work: the contrast of a visible, divinely sanctioned urban society, at once an exemplary congregation and a polity, set against a howling wilderness peopled by "savages."

In *Travels* Dwight is particularly attentive to cities, to their economic base, and to the social and political challenges they pose. The very formulaic and dogmatic quality of many of his assessments testifies to their unreflective and ideological nature. But sometimes they are acutely alert to change, and most particularly to threats to social discipline, morals, and Congregationalist orthodoxy. In ways that seem incongruous to a modern reader but which in fact reveal a characteristic eighteenth century association of ideas, Dwight's urban commentaries intersperse subtle readings of the economic social order with simplistic, deterministic readings of visual tokens and "marks of election." In the following sections we sketch four themes which are particularly salient in his accounts: urban morphology; the social benefits and challenges of urban size; the role of elite patronage and city-making; and most crucially, his reading of the growth of manufacturing and its centripetal concentration in cities.

Urban Plans: "Casualty and Contrivance"

Writing of Boston, Dwight regrets its lack of a regular grid and writes: "The streets strike the eye of a traveler as if intended to be mere passages from one neighborhood to another, and not as the open handsome divisions of a great town; as the result of casualty, and not of contrivance" (Dwight 1969, 1: 353). Dwight's urban ideals are in serious dissonance here. Boston was for him beyond serious criticism as one of the two Puritan heartlands in New England, yet for him neoclassical grids were a primary marker of urban worth and respectability. As John Reps (1965)

and James Vance (1990) have abundantly shown, urban layouts of the time were freighted with moral, symbolic, and practical significance. The towns and cities of New England exhibited striking variety in their forms, ranging from informal street villages to the bastide grid of Cambridge, Massachusetts to the "organic" form of Boston at the apex of the hierarchy.

As Peirce Lewis notes, compared to other regions of colonial North America, New England's embrace of the grid form was "half-hearted" (1990, 98). Dwight's own approval of geometric regularity in urban layouts was far from lukewarm, however, and precisely because it was by no means universal in the zone of his travels, he is able to use it as a convenient index of collective virtue in his endless quest for moralizing distinctions. Olwig (2002) suggests that in the early Republic the crucial modern interpretive dichotomy of organic (natural) and planned (artificial) urban forms may not have seemed compelling, for to the contemporary mind both rationality and geometry were "natural." Thus for Dwight it was not so much a matter of a planned order against an organic growth which might have some intrinsic virtues, but rather a matter of "casualty" that could lead to no good and spoke of a potentially hellish subversion of all order, and "contrivance" which could only – naturally –be expressed in extreme regularity and with a characteristic Baroque disregard for underlying topography.

In fact Dwight makes no distinction between the various kinds of urban layout distinguished by later scholars. Except in the one case of Washington, DC, which we will examine below, he does not acknowledge the existence of the hierarchic radial/grid forms that Vance terms "English Renaissance" typical of planned colonial sites such as Annapolis and Williamsburg. This is surprising, for their hierarchic structuring of places and buildings as central or marginal, important to unimportant, would surely have been congenial to his authoritarian mind. But it is true that such forms were not a feature of the landscapes of New England and New York with which he is mainly concerned. He does, however, approve of public squares. "Nothing is so cheerful, so delightful, or so susceptible of the combined elegancies of art and nature" (Dwight 1969, 1: 354). His rationale is precisely the one that Thomas Jefferson advanced for the layout of Jeffersonville, Indiana; squares combine beauty and health (Reps 1965, 317).

Although it was meant satirically, Dwight would not have been amused by a contrast which associated the logical temperament of Philadelphians with their orthogonal streetplan, while New Yorkers were revealed to be a "crazy-headed ... eccentric ... set of mortals ... the very antipodeans to the Philadelphians" by their irregular, narrow lanes (Burrows and Wallace 1999, 420). Dwight is a severe critic of plans which show slight deviations from absolute regularity. He reflexively reads the simple rectilinear grid as a sign of rationality and moral worth. Significantly he makes no effort to provide his hypothetical English reader with the kind of detailed nationalistic vindication of grid forms that he does for other features he fears may be misconstrued or patronized such as the stone walls of New England and the tradition of taverns also serving as lodging houses. The grid is taken as a shared and uncontroversial value, a norm for assessing other aspects of cities, to be held against them when it seems they have not lived up to the aspirations symbolized in their plans, and requiring extenuations and apologetics in cases such as Boston that he must approve of in spite of their irregularity.

In his description of home – New Haven, Connecticut – we see the principal axes of his understanding of urban space. Beginning in 1638 the town was systematically formed around

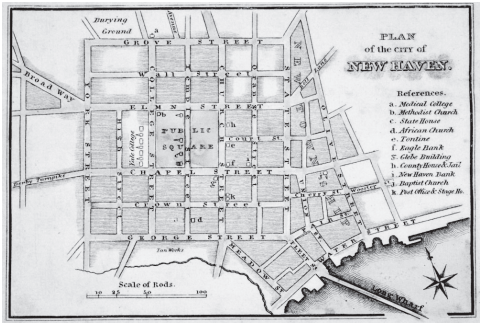

Figure 1. Plan of the City of New Haven, Showing its Layout in Squares. John Warner Barber, 1825. Source: Connecticut Historical Society, Hartford,CT; reproduced by permission. A version of this map appears in Lambert 1838, 52.

nine squares in what Vance terms a "bastidal layout" (1990, 262). It was spacious: perhaps a European city of the same size would have six times as many people, Dwight reports. The front courtyards and rear gardens thus created possessed a beauty and healthfulness that "need no explanation" (Dwight 1969, 1: 132). In New Haven Dwight sees in neoclassical geometric terms what the next generation was to see through the lens of romantic sentiment and middle class refinement – a rural (or at least a peripheral) cemetery. He rehearses what were to become familiar qualms about the dangers to public health and morality from the old, crowded, central Burying Ground. (Dwight does not mention the devastating yellow fever epidemics that had crowded it beyond its limits.) Cemeteries should be solemn and instructive places, he feels. It cannot be so in a crowded city, "in a gross and vulgar union with the ordinary business of life" (Dwight 1969, 1: 137). A local leader, U.S. Senator James Hillhouse, donated a plot for a cemetery (he was also a major benefactor of Yale College). Dwight links the project both to the geometric rationality of the grid (it is laid out in neatly measured parallelograms), and to aesthetics (it is handsomely railed, the railings are painted white and the monuments include Italian and marble "specimens"). He also symbolically claims the new cemetery for access to an emerging and refining upper middle class: there is room for carriages to pass. It is healthy because the "disgusting mansions" of vaults are not used, and the whole enterprise reveals "an exquisite taste for propriety" (Dwight 1969, 1: 138). The new peripheral cemetery is now known as Grove Street Cemetery. Dwight's hyperbole is substantially correct. The site was "altogether a singularity in the world," in the sense that it was the first chartered cemetery in the United States.

A more specific virtue of the grid in Dwight's mind is that it organizes and therefore underlines the authority of significant, distinguished, or otherwise notable structures that unify the landscape and symbolically subjugate it to the elite who live in those houses, preach in those churches, or rule from those civic buildings. Dwight's discussion of the town of his birth, Northampton, Massachusetts, nicely illustrates these points. It had been founded on a site of exceptional "size, beauty, and fertility." It is "eminently pleasant ... and ... makes a most cheerful appearance." Nevertheless, its ten streets are highly irregular "with no very distant resemblance to the claws of a crab." Local tradition holds that they were laid out by cows going to feed in the forests. "In spite of this irregularity," Dwight assures us, "the town with its scenery is a very interesting object to the eye" (Dwight 1969, 1: 238-9). But the failure of the layout adequately to site, orient, and frame important buildings has serious consequences.

> [N]ot a small proportion [of the] houses are handsome ... [but they are] ... so scattered in the different streets as to make much less impression on the eye than even inferior buildings [do] in ... other places where they are presented at a single view.

The deficiency does not impede economic progress, however, since

> [t]he stores and shops, built on the side of an irregular square in the center, give the traveler a lively impression of the business which is carried on (Dwight 1969, 1: 239).

Even in his original home there has been a decline in religion. His generation was not living up to the standard of their ancestors which Dwight measures by "punctual ... attendance on public worship" (Dwight 1969, 1: 240). The cause of this "degeneracy" is twofold as Dwight sees it: an increase in wealth and an influx of strangers. Both threaten the uniformity and the conformity he seeks.

In his account of Newburyport, Massachusetts, Dwight finds a mismatch between the beauty of the site and the contrivance of the citizens who fail to quite live up to it.

> The town is built on a declivity of unrivaled beauty. The slope is easy and elegant; the soil rich; the streets, except one near the water, clean and sweet; and the verdure, wherever it is visible, exquisite. The streets are either parallel or right-angled to the river ... None of them are regularly formed. The first settlers, not expecting the future growth of the town, neglected the peculiar advantages of its situation. Instead of laying it out in squares with wide, straight, and uniform streets, they made some of them wide, others narrow, few of them straight, some of them short, and no two, I believe, exactly parallel. Still there is so near an approximation to regularity as to awaken in the mind of a traveler ... a wish that the regularity had been perfect. For myself I confess, I was not a little mortified to see so fair an opportunity of compassing this beauty in so exquisite a spot finally lost, either through inattention, or undue regard to some private interest (Dwight 1969, 1: 317).

In the case of towns with unimpeachable Puritan pedigrees, Dwight is always willing to make allowances. Such is the case of Salem, Massachusetts. (For his enlightened English correspondent he deplores the witch trials.) His reading of the layout is unpromising. Essex Street, which contains the "churches and ... principal houses" is "handsome," most of the other streets are disagreeably narrow and unpaved. The commercial success of the town is a triumph over unpropitious circumstances. The harbor is ill-fitted for commercial enterprise. Almost all of the interior trade has been engrossed by Boston and is therefore of little consequence. But the industry, economy, sobriety, and perseverance of the inhabitants of Salem have found a remedy for all the evils of the local situation (Dwight 1969, 1: 323-4). In this special case, then, the streetplan is not diagnostic. In Dwight's description of Salem we also catch a glimpse of older periodic market systems. He notices that some of the "market people" who are used to carrying out sales house-to-house have resisted efforts to tie them down to a fixed market location (Dwight 1969, 1: 323). Providence, Rhode Island, too, has risen in spite of a poor natural endowment. Dwight notes that it may be the first city in the whole of New England for manufacturing, in which Providence has "a spirit and success unrivaled," and that its merchants are rapidly engrossing the

business of Massachusetts and Connecticut (Dwight 1969, 2: 20).

In areas that are more morally dubious such as the old Dutch city of Schenectady, New York no such allowances are made. "The streets cross each other often ... in many instances at right angles; yet from the differences of the distances between some and the obliquity of other streets, the eye receives no impression of regularity" (Dwight 1969, 2: 340). Similarly, in Portland, Maine, the streets "[l]ike those of most other towns in this country ... are ... destitute of that exact regularity, both in their position and direction, which would have rendered them entirely beautiful" (Dwight 1969, 2: 113).

In Puritan heartlands such as Boston and Salem, then, we find Dwight engaging in special apologetics to justify the historical, moral, and political stature of a city in spite of its unpromising street plan. In fact for him the association between plan and moral standing is not a deterministic one. It is a useful critical reflex that he constantly uses to hold irregularities in street layout as moral indictments against places of which – for innumerable different reasons – he disapproves. It is in his commentary on Washington, DC (excised from the published edition of the *Travels*) that we find perhaps the clearest example of Dwight's unwillingness to take a regular plan as a conclusive sign of virtue. In fact the city is a result of clear moral and political depravity. As noted in Pipkin (2009) he has the strongest aversion to the project because it is Republican, Jeffersonian, and principally because there are no churches in the plan. Dwight feels that Congress "in the plenitude of their power and with the pleasant emotions which a sense of power produces resolved to create a city and a metropolis. Full of this idea they fixed on a spot where nothing but a romantic imagination could possibly have dreamed of raising up even a village which was to be permanent and flourishing" (Dwight 1969, 2:401). Dwight has nothing against the physical form of the L'Enfant Plan in itself.

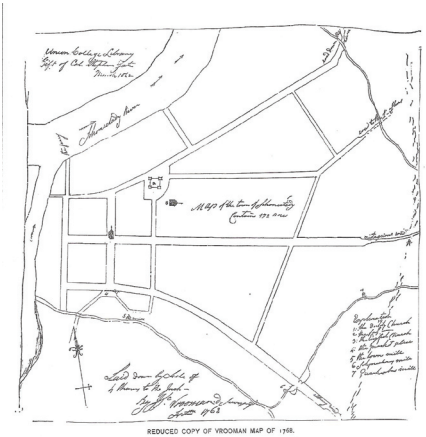

Figure 2. Schenectady, New York: copy of the Vrooman Map of 1768, J. MacMurray 1883, 328

> A French architect of great reputation ... was employed to draw up a splendid plan of the future American Metropolis. A palace was erected for the President and a capital (sic) for the Legislature. Magnificent streets were laid down upon paper with magnificent names (Dwight 1969, 2: 401).

In fact speculation in the land incurred "immense ruin ... of private fortunes" and the site stands forlorn and largely empty, a "semi wilderness." He sees, in fact, a catastrophic mismatch between the physical plan itself and all other features of the site: agricultural, economic, political, and religious.

The Sociology and Politics of City Size

Appropriate size, density, and physical compactness of settlements were extremely important to Dwight's ideal. He provides his hypothetical English correspondent with a formal definition of city in Connecticut (an incorporated place with mayor, alderman, and common council) (Dwight 1969, 1: 127). Technically there were five cities there at the time he wrote: New Haven, New London, Norwich, Middletown, and Hartford. However, he rarely uses the word "city" and occasionally refers to a place as both a town and a city (e.g., Hartford and New Haven). For the hypothetical English recipient of *Travels,* Dwight is careful to explain New Englanders' use of the word "town" (which was very different from British usage). He explains it as essentially a nucleated settlement in the "first parish" of an area, not to be identified with an administrative township. He discusses the ideal layout of such a place. It should not have, like the "landings" he has observed on the Hudson, a crude, clustered layout speaking only of mercantile and mechanical business, where the people seem only to be preoccupied with bargains and sales; where the location of the house is determined by that of the store, which is in turn determined by the location of the wharf, as he puts it. Real towns and cities are devoted to a full range of social relations. Courtyards, gardens, and orchards are natural adjuncts to such a settlement, which speaks of superior intelligence and manners. In such places "[a]ll people are neighbors: social beings, converse, feel, sympathize, mingle minds, cherish sentiments, and are subject of at least some degree of refinement" (Dwight 1969, 1: 246).

Urban size is crucial to Dwight's idea of a well-ordered political process. Recalling the public assemblies of antiquity and the long local tradition of the New England town meeting, Dwight wants the voters to be physically present. This implies for him, just as it had for Aristotle, a definite though unspecified size limit on the body politic. Dwight's insistence on this is by no means at odds with his aversion to what we would recognize as democracy. In fact there is a strong paternalistic subtext affirming the suasion and example of natural leaders in opposition to the less controllable balloting of party-based politics. Dwight favors what Habermas would term representative publicity, a theater of elite leadership in public space, before a passive and politically acquiescent audience (Habermas 1989). In Dwight's view moderate size was an enabling condition for such politics. Excessively large and unruly "popular meetings" such as those of metropolitan Athens and Rome were "disgraceful" and should be avoided. The moderate size of Connecticut assemblies accounted for their good order, their "honorable decorum," and the absence of "noisy, tumultuous proceedings and rash measures" (Dwight 1969, 1: 179).

With a characteristic association of ideas, Dwight links moderate size to a middling condition of wealth and its associated virtue of modest ambition: "that middle state of property which so long and so often has been termed golden, because in this situation the best character and the most sincere enjoyment are usually found. Few are poor, and few are rich" (Dwight 1969, 2: 184). In his mind, this is one of the cardinal virtues of Connecticut compared with other states. Many commentators on Dwight have noted the extraordinary significance he reads into Connecticut's modest size. (It never had a royal governor, for example). While this betrays an undeniable parochialism – in an observer who never left the northeast – Dwight made it a theoretical and political virtue.

In Dwight's lengthy meditation on morals in frontier areas of Maine we find a particularly clear expression of his fundamentally centripetal cultural concept of good order (Pipkin 2009). He is an educator and naturally he focuses on the socialization of children in scattered settlements. His arguments are in fact strikingly reminiscent of the claims made for a "culture of poverty" by conservative American urbanists in the twentieth century. In highly dispersed settlements children grow up "destitute of regular catechetical instruction" and hence they are comparatively ignorant of morals. Occasional "religious parents" may "extend a happy influence over the neighborhoods around them" but the most fundamental requirement for Dwight is regular, organized, locally-funded, "enlightened public worship." Without being "awed and restraint" by such examples children will see as role model "adventurers ... [and] roving, disorderly, vicious men" and with "such examples ever before them" will become "nuisances," and practice "every enormity" (Dwight 1969, 2: 162).

Small size is a religious threat because there may not be enough people to support a minister. Mandatory local support for ministers and their families through payments that fell to some degree within the discretion of local congregations was an extremely contentious issue in Connecticut and Massachusetts where the church was established in colonial and early national times (Berk 1974; Bushman 1967). So crucial was such support that Dwight was willing to bend his denominational principles to permit it. Thus in Manchester, Vermont (Dwight 1969, 2: 285) he notes that the settlers were divided in their religious opinions. But they exercised "a catholicism less common than could be wished" and allowed preaching on successive weeks by representatives of the various denominations. They thereby "secured to themselves that otherwise would have been unattainable, the public worship of God." Citizens of Manchester, by some means that Dwight does not specify, filtered potential preachers by "character, deportment, and preaching" to find those against whom "there could be no reasonable objection." A similar effort, which resulted in a fiasco, was excised from a published version of the *Travels* (along with similar draft passages which are recovered in the notes of the Solomon edition). One such tactful omission is a scathing indictment of the morals of Burlington, Vermont. "All" the religious people in Burlington gathered together to organize a church. (Dwight tells us that there were eight or nine such people. It is hard to know whether he is smiling; probably not.) The law required them to declare what denomination the church was to be. The Burlingtonians considered this requirement. Someone spoke up and said he has never paid this question any attention, and he assumed his neighbors hadn't either. They agreed and everyone went home. The church was not formed. As if summarizing a case for the prosecution Dwight records that he also saw "a large collection of people assembled on the Sabbath at an inn for the purpose of drinking" (Dwight 1969, 2: 402-403).

Dwight uses several other arguments to support what he sees as an adequate community size. It was, for example, implicated in an appropriate but not excessive number of governmental units, particularly counties. Dwight opposes the "spirit of subdividing" both in local government and in church parishes. In the church, it produces parishes too small to repair their churches and support their ministers (Dwight 1969, 1: 127). In politics, he argues that it gratifies the wish for offices for "men ... impatient to become judges, sheriffs, and county clerks." Such offices are apt to be multiplied "to a useless degree" and "[h]e who voted for the last claims the suffrage of him

who has been profited by that vote ... [and so] a silly and deplorable ambition becomes a source of multiplied mischiefs to the community." Here Dwight is seeking to contain what Bushman (1967) suggests was both a cause and consequence of the centrifugal movement of population into new parishes and daughter settlements in New England in the century before Dwight: the desire for upward mobility in church and town offices. Dwight fulminates, for example, about the breaking up of the county of Hampshire, Massachusetts into three smaller counties in 1811 and 1812, which he shrilly associates with a political desire to destroy firm order and sound principles (Dwight 1969, 2: 187).

An excellent example of Dwight's disapproval of a city he perceives as too small appears in his account of Montpelier, Vermont. Montpelier had been chartered in 1781 in a land grant to settlers from Massachusetts. It was chosen as state capital in 1805 six years before it was chosen as county seat for its county. When Dwight saw it, it comprised "thirty or forty buildings, houses, stores, and shops" clustered in a valley, with a statehouse already begun. Dwight feels that it is far too small. With his usual eagerness to assign moral blame he concludes that the choice was so unwise that it must have been based on "very limited or very prejudiced views" (Dwight 1969, 2: 304). He enumerates what he sees as the basic requirements for a state capital. The town should be large and if possible commercial. Blurring cause and effect, perhaps, he would expect "agreeable accommodations [for] governmental agents ... [and a] stream of business" alongside "improved manners, extensive information, and acknowledged respectability." Furthermore "[a]ll busy men must have their hours of relaxation; and, where refined and superior amusements cannot be obtained, will to a great extent spend those hours in such as are trifling and contemptible" (Dwight 1969, 2: 304). Detailing the local configuration of routes and mountains with his usual sensitivity to physical geography, Dwight concludes that the site of Montpelier is such "as to forbid the hope of any future, material enlargement." The key issue in his mind seems to be the need for a match between the respectability and refinement of the natural aristocracy who rule, and the urban amenities that are their due. He presents New York City as a magnet for an elite with "superior talents and information" who are drawn to the city because "[t]he field of effort is here more splendid, and the talents are more needed, honored, and rewarded than in smaller towns" (Dwight 1969, 3: 331). When Dwight discovers refinement and polish in places that he sees as too small, he is startled into patronizing approval. For example, in Provincetown on Cape Cod, Massachusetts the manners were "becoming, plain, frank, obliging, and obviously sincere. Nothing was perceived of the roughness which I had expected from a mere collection of fishermen and sailors" (Dwight 1969, 3: 63).

Yet on another level, urban size was a threat. Dwight's idea of urbanism is one that is threatened by diversity; one of the principal functions of cities is to awe and restrain newcomers. Here he rehearses critical mass and threshold arguments in terms that foreshadow modern subcultural theories of urbanism (e.g.,, Fischer 1975). Dwight is particularly concerned about the way that cities catalyze the formation of unorthodox and heretical congregations. Thus, again writing of Maine, he notes that when people with different views, educations and opinions come together, and the settlements become sufficiently "advanced" (large) to support a minister, they find themselves split into several discordant sects, "each too small and poor to maintain a minister for itself." They bicker, and "end in alienation from religion and dissoluteness of manners." In

fact they come to see religion as nothing other than an "odious" form of "party zeal." They will end, as miscreants so often do in the homilies embedded in Dwight's texts, in "mere nihilism, and a total disregard of moral obligation." The precarious religious order is in danger of subversion from the outside, too, by "ignorant, wandering, and unprincipled preachers" (Dwight 1969, 2: 162-3).

Diversity is specifically a threat because it breaks up the monolithic religious and moral uniformity which is central to his idea of urbanism. For example, speaking of Tolland and Stafford, Connecticut Dwight briefly notes that they have been divided by "religious and political and religious contentions" and "have very little cause to congratulate themselves on the moral influence of these divisions" (Dwight 1969, 2: 137). His unpublished notes indicate that inroads had been made by Methodists who had the temerity to build a small church (Dwight 1969, 2: 389). Religious diversity is a problem in Portland, Maine, too, despite the fact that "few towns in New England are equally beautiful and brilliant." There are three Presbyterian, one Episcopal, one Baptist, and one Methodist, congregations, and

> [s]uch a collection of inhabitants, gathered by business and by accident from many quarters, must be supposed to bring with them a corresponding mixture of principles, and in many instances may easily be believed scarcely to have formed any principles at all (Dwight 1969, 2: 142).

This is an unfortunate moral state of society for Dwight and he wishes, but does not expect, the influence of "superior talents united with superior piety." In an unpublished note he expects these "mere counterfeits of Christianity" to continue (Dwight 1969, 2: 390), although were such efforts to be made "they could ... hardly fail of success" (Dwight 1969, 2: 142). This thought reveals Dwight's almost wistful insistence on the scope of elite moral effort to elevate whole cities.

Urban Benefactors: Zeal and Liberality

Dwight visits President John Adams (no political friend of his) in retirement in Quincy, Massachusetts. He is turning, very literally, into a farmer. Dwight salutes this metamorphosis, noting that for an old man to engage in business ("the counting house") would be awkward and troublesome; that in a legislature, his influence and reputation would be in decline; besides, a rural retreat is spiritually the place to spend one's little remaining time on Earth (Dwight 1969, 3: 81). This trope of rural retreat, with its resonance of Whiggish gentry on their country estates resisting Tories in London was one that Dwight was familiar with. In previous work (Pipkin 2009) I noted the role of elite leadership in shaping rural society and projecting urban refinement outward to discipline rural populations. The point I want to illustrate here is a symmetrical but distinct idea, namely that for Dwight elite benefaction is at work shaping urban destinies. Social leadership and patronage of a "natural" aristocracy were, of course, axiomatic in the age of Jeffersonian democracy (e.g., Sargent 1997, 161). Indeed, the lack of any mandates about municipal government in the Constitution left a political void in urban administrative machinery that was filled by elite benefactors, with consequences that lasted until the Progressive Era. Thus,

as late as the time of the City Beautiful Movement, elite *ad hoc* commissions were still a common source of municipal improvements. In the Federal period such patrons were active in many ways and Dwight's *Travels* implicate them as benefactors of towns and as authors of new ones. In fact his treatment of elite improvement projects strongly *unifies* his sense of town and country.

Sometimes the effect of elite patronage is incremental. Thus, the regrettable streetplan of Boston is being greatly improved by elite projects around Beacon Hill. But sometimes Dwight celebrates actual town-making. In his journey to Niagara Falls in 1804 he visits Hudson, New York. He had been there in 1792 and at that time had misgivings. He feared it "had arisen to the utmost height of its prosperity, for it evidently appeared to be stationary, if not retrogressive." But twelve years later he finds it "much improved." In fact "[e]verything which I saw had the air of sprightliness and vigor ... the appearance of enterprise and prosperity." He recounts Hudson's history. It was a naked waste in 1783 when it was settled by two Rhode Islanders, Seth and Thomas Jenkins and other New England proprietors who "united to themselves a considerable company of adventurers" (Dwight 1969, 4: 91). A close reader of Dwight will sense a moral shadow falling with the word "adventurers." However, their adventure was justified because it was successful. They were seeking to develop a safe whaling harbor out of reach of the British navy. They aggressively laid out a grid and built 150 houses with stores, shops, and wharves. Within two years the city was chartered (1785), and ultimately came within one vote of being the capital of New York State. This "commendable spirit of exertion" (Dwight 1969, 4: 92) is revealed by houses which are "generally built of brick, and make a handsome appearance ... The river is a noble object ... the Catskill Mountains, here seen in the best view imaginable ... are eminently sublime. " A sublime setting and commendable human industry invariably signal for Dwight a sense of moral uplift. And, in fact, Hudsonians "are said to be justly distinguished for their temperance" (Dwight 1969, 4: 92). The Jenkins family became ensconced as hereditary mayors of the city (Dwight 1969, 4: 381), very much in the tradition of Connecticut Federalism.

In Dwight's mind, elite patronage of religion was a powerful force for urban transformation. In 1815 he visits the little river town of Catskill, New York which

> has become a considerable town, containing many valuable houses and stores, a courthouse and a Presbyterian church, both new and handsome. Its moral aspect has also materially changed. Religion has spread, and is still spreading, extensively over this settlement. A Bible Society for the county of Greene was formed here on the day of my arrival, with a zeal and liberality very honorable to the gentlemen concerned (Dwight 1969, 4: 124-125).

Academic leadership (in an age when "academies" were rapidly diffusing) was another key source of urban patronage and discipline in Dwight's mind. On several visits to Schenectady, New York, he keeps close watch on the development of Union College. On his second visit in 1799 he lodges with President Jonathan Edwards, who is in fact Dwight's uncle, son of the great New England theologian Jonathan Edwards. Dwight does not inform us of the relationship, but he assures us that "The Rev. Doctor Edwards, president of Union College in Schenectady, is considered, extensively, in this country as not inferior to his father, either as a logician or as divine" (Dwight 1969, 1: 243). This pairing of logician and divine nicely combines the secular

and religious facets of Dwight's approval.

On a subsequent visit to Schenectady in 1811 Dwight encounters the most famous and long-serving President of Union College, Eliphalet Nott. They do not appear to have been previously acquainted. Nott had impeccable credentials in the religious sphere, having previously served as a successful pastor of First Presbyterian Church in Albany. He shared Dwight's interest in moving modern sciences forward in the older classical curriculum, seeking to do at Union essentially what Dwight had accomplished at Yale. Yet Dwight the Congregationalist theologian must have had reservations about Union's aggressive non-sectarian stance, and it is hard to imagine that Dwight the Francophobe wholeheartedly approved of Union's new motto, significantly phrased not in a classical but in a modern language: *"Sous les lois de Minèrve nous devenons tous frères."* In this context of a college founded in an old and quite large city - one which Dwight sees as Dutch and regressive - he must address what he perceives to be a morally dangerous social gradient, in which town-boarding students are apt to be corrupted by morally "dissolute" river men. He feels that students will do better on a residential campus, under the direct supervision of their instructors. On his last fleeting visit in 1815 he glimpses in the distance Joseph Ramée's new residential campus for Union College which was just beginning to take shape, a landmark in American campus design. He wholeheartedly approves of the way it insulates students from moral corruption and from what he could see of the new structures, he "thought them handsome buildings" (Dwight 1969, 4: 128).

There are limits, however, to Dwight's willingness to approve city-founding patronage by magnates. At several points in the *Travels* Dwight excoriates Ethan Allen, despite his having been born in Connecticut, and despite his having "made some noise" in the Revolution (Dwight 1969, 2: 283). Dwight rehearses several anecdotes impugning Allen's lack of self-control and most particularly his agnosticism. Dwight was contemptuous of Vergennes, Vermont, Allen's city-founding project of 1788, named to honor the French foreign minister who was instrumental in concluding the Treaty of Paris. The association with the hated French is not a matter that Dwight passes by without comment, noting scathingly that "ardent, uninformed, and short-sighted Americans ... believed [the Comte de Vergennes] to be a friend to this country" (Dwight 1969, 2: 293). Dwight dilates at length on the "freak" of Colonel Allen and the "equally freakish" legislature in believing that the city, intended as a seat of government, had any chance of success at such a remote location. Dwight registers some skepticism that the mobile legislature of Vermont would ever settle down in one place. If it were to, he argues that it would make more sense to locate in Burlington or Windsor than on tiny Otter Creek in Vergennes, because people will "never come hither for trade" (Dwight 1969, 2: 294). Two hundred years later Vergennes remains one of the smallest cities in the United States and it is hard to deny that Dwight had a point. But undoubtedly his animus against Allen as a morally unworthy patron of the place played a role in his assessment. It is in the context of this tirade that Dwight's unpublished remarks on Washington, DC found their place. "[W]hatever emotions of sport or contempt a traveler may indulge while contemplating the dream of Ethan Allen and ... the people of Vergennes, both are perfectly kept in countenance by a dream equally baseless of their superiors" (Dwight 1969, 2: 400).

Dwight's moral reading of urban grids and his symbolic insertion of rural elite leadership

into cities come together in his assessment of the Commissioners' Grid for Manhattan which had been unveiled in 1811. Commissioners Morris, Dewitt, and Rutherfurd were promoting a vision of Federalist land development and empire building under a state mandate to promote health along with public convenience and commerce (Burrows and Wallace 1999, 419). The "fearful symmetry" of their epochal plan inscribed with brutally simplicity commerce, efficiency, and elite values – in a word, Federalist values – backed by the state. The grid was being staked out on the ground precisely during Dwight's 1811 visit. Naturally, he wholeheartedly approves and criticizes the narrow and "winding" streets the plan was replacing (Dwight 1969, 3: 315), although he seems to overestimate the amount of open space and land "sequestered for public use" that the cramped grid would produce. Anticipating the good effects of the layout, Dwight carefully inscribes an elite presence over the whole of Manhattan. Among "houses of an inferior class, belonging to gardeners, farmers and mechanics who live in them through the year" are "[a] great number of villas ... placed in almost all the pleasant positions on the island ... [which] spread over it a brilliancy and cheerfulness not surpassed in the United States" (Dwight 1969, 3: 314-315). Thus an elite group of rural magnates are assimilated into the growing fabric of the city.

Manufacturing

Just as Dwight seeks to incorporate rural gentry into urban settings, so he makes an even more significant elision in his Federalist enthusiasm for manufacturing industry. He associates it in several ways with elite patronage and with social discipline, a thoroughly un-Jeffersonian perspective. Laura Rigal (1998) traces what she sees as a profound connection between the transformation of the labor process from artisanal, craft, and workshop production to larger scale mill and factory work, and new symbolic representations of nation and culture using a language of production. She suggests that a culturally constructed idea of labor simultaneously "manufactured 'nation' together with 'work' and 'labor.'" Indeed enlightenment constructions of rational artifice, contrivance, efficiency, and scientism, saturate the educated discourse of the time, including Dwight's conservative, religiously shaded texts.

A telling juxtaposition of hereditary and entrepreneurial leadership occurs in one of Dwight's accounts of Albany, New York. Within the city stood the manor house of a genuine feudal aristocrat, heir to the Patroonship founded by the van Rensselaers around 1630.

> At the head of Market Street stands the mansion of the Hon. Stephen Van Rensselaer ... [it] struck my eye as ... comporting with the fact that for a long period it has been the residence of an ancient and distinguished family. The situation though not much elevated is fine, cheerful, and prospective ... beyond it is seen a handsome acclivity ... upon which stands the neat, sprightly village of Bath. The house is large and venerable, and looks as if it was the residence of respectability and worth (Dwight 1969, 2: 348).

Dwight notes that van Rensselaer "holds probably the first or second landed estate in the Union, and by the benevolent use which he makes of his large fortune has given ample proof of a mind

suitably entrusted by Providence with the disposal of such extensive property" (Dwight 1969, 2: 408). The manor house was soon to be engulfed by industrialization and lumber yards and the Erie Canal was to pass through its grounds (idealized by Thomas Cole in *The Gardens of the Van Rensselaer Manor House* in 1840, well after the changes had begun).

Immediately after his hagiographic account of the mansion's inhabitants, and without any discursive break, Dwight turns his eye west to celebrate elite leadership of a different kind.

> [A] small distance from this house westward is the most extensive collection of manufacturers (sic) which I have seen in the possession of a single man. The proprietor is James Caldwell, Esq. In these works barley is hulled, peas are split, and hair powder, starch, snuff, tobacco, mustard, and chocolate are manufactured. I visited them in the year 1792 and thought the manner of performing the business ingenious and happy (Dwight 1969, 2: 348).

Caldwell was a relatively poor Protestant Irish immigrant. He worked as a retail courier in Pennsylvania and then moved to Albany, setting up a grocery retailing business, catering specifically to Scots-Irish immigrants, and specializing in tobacco. During the Revolution he supplied the army and later developed the extensive tobacco and food processing plant Dwight saw. It was water-powered and covered more than an acre. Barbagallo (2000) provides a detailed account. Humble though Caldwell's origins were, Dwight was ready to salute his industriousness and success, noting approvingly how he had bounced back from a devastating fire in 1794 and how he employed 40 boys in addition to other workers. Dwight thoroughly approved of Caldwell's politics. Indeed Caldwell was hit by a brick while marching as a Federalist in an Albany parade to celebrate ratification of the Constitution. Dwight approved of his religion and his generosity too. Caldwell erected a Presbyterian Church in 1810 at his own expense in the eponymous village of Caldwell, near Lake George, New York (Dwight 1969, 2: 408). With this textual juxtaposition and glowing praise of a feudal hereditary aristocrat and an unprecedentedly successful Irish manufacturer, Dwight approves and symbolically unifies old and new avenues of elite patronage. Prowess in manufacturing becomes a dimension of a natural aristocracy, and technical innovation becomes kind of gift that his elite give to the world. Thus among the "polished people" residing in Lancaster, Massachusetts, "distinguished for industry, sobriety, and good order," is Colonel Caleb Wilder, the "author" of a method of mass producing potash, the main industrial chemical of the eighteenth century (Dwight 1969, 2: 175; Roberts 1972).

Sometimes Dwight registers positive sympathy for small manufacturing enterprise that shows little promise of success. For example in Ipswich, Massachusetts he finds a small family-run woolen manufactory, with a few people carding and spinning. He entertains "faint hopes of its future success" and pities the proprietor whose "enterprise and public spirit we thought merited a better reward" (Dwight 1969, 1: 320). But the work of this petty manufacturer is cast as a public benefit. The problem, Dwight feels, rests with sparse population, very high labor costs, and in the fact that workers will only be available at slack times of agricultural production. He notes that things would go better if machinery were substituted for labor and proceeds to criticize conservatives who denigrate industry because they feel that prosperity rests on commerce alone.

An account of the scope of manufacturing in the United States was provided in a report issued during the Madison presidency by Albert Gallatin. Portions were widely published in the newspapers of the times (e.g., *Connecticut Herald* 4 June 1810). Dwight extracts data from the Gallatin report directly into *Travels* (Dwight 1969, 4: 339). The report covers precisely the time when Dwight's autumn journeys were occurring regularly, when the book project was taking shape in his mind, and when manufacturing was gaining in cultural acceptability. As Hartford's *American Mercury* had put it as early as 18 April 1791, "Those politicians who deride the idea of Connecticut's becoming a manufacturing country should never be considered as friends to the state." At roughly the same time Hamilton was declaring "The expediency of encouraging manufactures in the United States, which was not long since deemed very questionable, appears at this time to be pretty generally admitted" (cited in Griswold 1946, 681). By the time Gallatin wrote even many Jeffersonian Republicans were taking a nationalist and pro-manufacturing position (Shankman 2003). The protective and nurturing effects on manufacturing of Jefferson's embargo, which earlier critics had discovered spelled "O! grab me" backwards, were coming to be appreciated.

In the northeast the history of artisanal production was already long. It included ubiquitous use of local materials such as bog-iron, the production of clothing locally from wool and flax, and waterpower used extensively for grist and saw milling. The relationship between manufacturing and urbanism in antebellum New England was, however, far from integral. Bog iron was widely dispersed along with charcoal fuel; waterfall sites were usually rural; and processing of food products and some early large scale manufacturing processes such as potash burning were intrinsically oriented toward farms. In fact, as Prude (1983) notes, the "set apart" character of many early manufactories resonated with cultural reserve, "rural discretion" and – far more compellingly – with the protection of secret and proprietary technical processes. Yet, as Prude also notes, it was in towns, and one might add all the more in cities, that the "pressing together" of difference, of the old and the new, was particularly acute, and particularly "conscious and vivid in cultural representation." As the mill system expanded larger cities became more and more attractive as sites of labor that was not merely cheap but was also unconstrained by a key constraint on rural labor (Prude 1983). This is a question that Dwight did not apparently address but which was an extremely pressing one for farming families. Should their sons and daughters go to work in manufacturing? Was it right? How would the farm work get done? Although in principle the family was the least formal and prescriptive of the local ties that bound people into the matrix of township, village, and locality, the sway of family was extremely strong (Brown 1974). Custom, tradition, and function all made it difficult to leave home. This applied with much less force to urban populations.

Dwight seems more comfortable with factories because he thoroughly approves of the space-time disciplining of labor associated with the new dispensation of the mills. He was well aware of the technical restructuring of skills that underlay the transition to the mill system, as he reveals in a hagiography of Eli Whitney (Dwight 1969, 2: 196-99). Dwight would surely have favored the boarding conditions, to say nothing of the religious obligations, of the mill "girls" and of the Lowell system as it developed immediately after his death. He certainly also celebrates the traditional family as locus of industrial discipline, for example where weaving is

done as piece work "in private families" (Dwight 1969, 4: 348). But between the disciplines of the mill and the family lay a morally treacherous world of "shops." Dwight is incessantly scandalized in the *Travels* by finding people in taverns, particularly early in the day, an observation that provides a glimpse of the work rhythms of the workshop mode of production where time was measured out with liberal informal breaks, with and without alcohol. In one such setting near a Susquehanna River crossing, "[a] traveler ... is molested by night and by day by a collection of dram drinkers, who offend his eye by their drunkenness and his ear with their profaneness and obscenity." In fact dramshops "spread little circles of drunkenness throughout the state" (Dwight 1969, 4: 11-12). He makes no mention of the intellectual aspirations, the reading rooms and cultural events of urban artisans of the time (Wilentz 1984).

Like other Calvinist moralists Dwight was also uncomfortable with the idleness which the New England winter thrust upon the men, although hardly the women, in farming communities. Better manufacturing than the devil to find work for idle hands. At the site of one of the first rolling mills in New England he notes that "[i]n the winter season, the inhabitants of Middleboro are principally employed in making nails." Not only is it profitable but also "fills up" part of the year in which they would otherwise "find little employment" (Dwight 1969, 2: 2).

Dwight does not appear to register any concerns about the emergence of the culturally distinct class of industrial workers in cities which was to form the "other" of refined middle class and elite sensibility for most of the rest of the century. The words "artisan" and more often "mechanic" were equally applicable to craft and factory based workers. For him, mechanic connotes a non-mercantile manual worker, practicing a trade or craft. (The *Oxford English Dictionary* actually uses a portion of *Travels* to illustrate early nineteenth century usage of the word.) Dwight usually inscribed mechanics above a line that marked off vagrants and laborers. In New Haven, for example, there was a class of worker about whose morality Dwight was very doubtful. He calls them "laborers." He does not seem to extend this term systematically to farm employees or to industrial workers *per se*, whether in workshops, piece work, or in mills. He appears to apply it to temporary or transient day-laborers "who look to the earnings of today for the subsistence of tomorrow." In fact the ranks of urban day-laborers were growing because the door to the traditional apprentice-journeyman-master roles had been closed to them by the new organization of production. Dwight sees such men as "shiftless, diseased, or vicious" (Dwight 1969, 1: 139). But these lines are apt to be blurred by New England exceptionalism and special pleading. In New Haven Dwight morally approves of the work habits, "industry," and "economy," of *all* the inhabitants. As for an ideal New England town as he describes it abstractly to his correspondent: even the "mechanics" in such places "aim at a higher degree of respectability than in most parts of the country." Some of them, indeed, "merit the appellation of gentlemen" (Dwight 1969, 2: 231).

The various threads of Dwight's approbation of manufacturing and its innovators come together in his account of Humphreysville, Connecticut, the site of new cotton and woolen mills. Dwight celebrates the patronage of David Humphreys, one of Washington's aides-de-camp, whom Dwight knew and with whom he had much in common. They were Connecticut Congregationalists and Humphreys was a Yale graduate in addition to being a military officer and a diplomat who harbored literary aspirations as high as Dwight's own. Both men were

"Connecticut Wits" (Howard 1943). Humphreys supposedly admired Washington so much that he came to look like him. It certainly appears so in John Trumbell's painting of 1824, *General George Washington Resigning his Commission*, which has Humphrey standing immediately behind Washington. Humphreys' *Collected Works* contain odes, a burlesque epithalamium, elegiac stanzas, lives of several public figures, a pastoral, political observations, a dissertation on the merino breed of sheep, and a poem on the industry of the United States. The latter argues nationalistically for domestic manufacturing, particularly in textiles:

> But what vile cause retards the public plan?
> Why fail the fabrics patriot zeal began?
> Must nought but tombs of industry be found,
> Prostrated arts expiring on the ground?
> Shall we, of geegaws gleaning half the globe,
> Disgrace our country with a foreign robe?
> (Humphreys 1804, 103)

Humphreys had founded a very successful woolen mill in 1803. Dwight paints him as a patron of the land. "The people of this country are ... indebted not a little to General Humphreys" (Dwight 1969, 3: 276). Unlike foreign artificers such as Samuel Slater, Humphreys is a specifically *national* hero. Moreover his contributions solidly tie together agricultural and industrial innovation. The *Gallatin* report had noted that a principal constraint on the American textile industry in New England was the availability of wool. Humphreys introduced the merino sheep to the United States and overcame the prejudices of local farmers against it. Dwight the educator also notes that apprentices in Humphreys' mill are instructed in reading, writing, and arithmetic.

From Humphrey's mills Dwight the moralist draws three lessons. First, that manufacturing can be successful in Connecticut; second, that the workers can be "preserved" in good health. And third is his key moral conclusion: "the deterioration of morals in such institutions, which is so often complained of, is not necessary, but incidental, not inherent in the institution itself, but the fault of the proprietor" (Dwight 1969, 3: 277). Here Dwight is explicitly refuting the European (and Jeffersonian) claim that manufacturing establishments lead to vice and disease. Anticipating the kind of argument that was to ensue about the employment of the mill girls in Lowell, he notes that parents were originally reluctant to have their children work for Humphreys, but that now they are satisfied. He records, nevertheless, the constant policing of the mills by state appointed visitors and notes the firing of anyone found to be "openly immoral" (Dwight 1969, 3: 276). In this extraordinary piece of rhetoric, Dwight seeks to tie together and legitimate sheep rearing, urbanism, factory-based manufacturing, moral education, and elite leadership.

Conclusion: The Symbolic Center and Elite Control

Living at a time when the "agrarian dream" (Ekirch 1963) was fading and in a place where the earliest effects of urbanization and manufacturing were all around, Dwight presents us with a paradox. He was a conservative and parochial apologist for the religious and political *status quo* of New England, but he lived in an age of political and economic revolution. Thus we find a mind predisposed to take the dimmest view of innovation anxiously observing and celebrating it in the landscapes around him, but striving always symbolically to assimilate it to his Federalist and Congregationalist precepts of order, morality, and elite dominance. Visiting Troy, New York in September 1811 Dwight records:

> Troy is one of the most beautiful and well-built towns which I have seen ... The streets are wide, straight, and spacious; and the town ... perfectly regular ... Upon the whole, there is hardly a town in the country forming the object of these letters which makes so cheerful, brilliant, and beautiful an appearance (Dwight 1969, 3: 295-296).

Dwight was just passing through and perhaps did not probe for moral turpitude and backsliding as thoroughly as usual. At any rate this description is a uniquely positive one among his accounts of cities outside the Puritan heartland. Dwight reads all the superficial signs very affirmatively – a picturesque location, many churches, "neat" brick buildings with gardens, and a perfectly regular grid. Nevertheless as his account proceeds a political shadow falls. It is cast by the embargo of 1807. The locals assure him that real property in Troy had lost a quarter of its value because of this economic reversal. Before the embargo Troy had "engrossed" the trade of the western half of Vermont and was

> one of the most prosperous towns in the American Union ... [but that] disastrous measure ... drove the people of Vermont to Montreal. This channel of commerce having been thus fairly opened, the stream will not probably return to its former bed without extreme difficulty (Dwight 1969, 3: 296).

This account well illustrates the disconcerting contrast between Dwight's impulse to stereotype and moralize landscape (e.g., taking a regular grid as a sign of virtue) and his penetrating observation of the emerging features of the new economic and social order. He was alert to the mercantile networks, banking, debt, trade hinterlands, central places, points of attachment, supply routes, and entrepots penetrating every corner of his world. Above all, he was alert to the outburst of creativity in American manufacturing that flourished under the Jeffersonian protectionism which Dwight theoretically abhorred.

Not only does he understand the growing scope of manufacturing, but he sees it as an adjunct to commerce in recouping the mercantile losses of the embargo years and as a way for smaller communities to offset the concentration ("engrossing") of commerce in Boston and New York City. He clearly observes what we would term the externalities and multiplier effects of the new mills, which awakening a "new animation" in

> almost every other pursuit ... laborers, diggers of canals, lumber merchants,... brass and iron founders ... carpenters, masons, ... blacksmiths are all employed in greater or less degrees by the erection of a cotton manufactory (Dwight 1969, 4: 348).

He even anticipates the possibility that cities may ultimately come to depend on manufacturing to the exclusion of other business. In Rhode Island

> It would be no exaggeration to say that five eighths of her inhabitants are directly or indirectly employed in the manufacture of cotton [and dependent industries] ... Whether this direction of the industry of Rhode Island will promote her moral prosperity, time only can determine. There can be no doubt ... that it will increase her wealth and population (Dwight 1969, 4: 347).

This move from confidence in economic success to doubt about moral consequences signals Dwight's ideological agenda: to subordinate social and economic change to traditional elite control.

Cities were the traditional locus of this control in New England. Dwight takes them for granted as the principal organizing force in the landscape, exerting discipline –as they had since the seventeenth century – over a margin of farmers, foresters, and unruly wanderers, who might always engage in insubordinations like Shays' Rebellion (1786) or worse. This "rebellion" in west-central Massachusetts had made very clear the rural reach of urban merchants, mortgage-holders, issuers of scrip and ultimately of the militia that suppressed the minor uprising (Peet 1986). Dwight, the moralizing conservative, was alert to the new infusions of urban population and ideas after the Revolution, notably the mobilization of opposition to traditional northeastern Federalist elites for whom urban artisans and mechanics were no longer natural allies (e.g., Clark 2006, 65). To think through an appropriate size for cities was an anxious business for Dwight. As we noted above he was alert to what we would call the threshold and subcultural effects of size, which could have potentially good consequences (e.g., critical mass for a congregation) but which posed risks of religious diversity, party politics, and democratic enfranchisement. Through all manner of metaphors Dwight symbolically reaffirms elite control of urban space. Reading deviations from regular morphology as if they were lapses of elite morals, and inscribing a rural pattern of patronage into city founding and urban leadership are two examples.

If the cities of New England were old, large-scale manufacturing was new. Dwight was well aware that there was nothing intrinsically urban about a mode of production so deeply tied to water power, farm output, rural workshops, "putting out," and dispersed raw materials. But his impulse is centripetal, and he symbolically fuses industry with urbanism. Factories provide a new locus of moral discipline. They act as nuclei for new settlements around rural waterfalls, provide work for idle farm labor in winter and for boys all year round, and they discipline drunken mechanics. They are celebrated as icons of elite patronage and are interpreted in nationalistic, anti-immigrant terms. Thus the mill technology brought from England by Samuel Slater (founder of the Pawtucket Mills) in 1789 was considered mysterious and hazardous for a few years, but then the "fearlessness" and "vigorous ingenuity" with which American "gentlemen" took to the innovation guaranteed not only its success but the exclusion of foreign workers

(Dwight 1969, 4: 348). And in all cases the moral effects of such places are read as being entirely within the control of sufficiently strong leaders: iconic figures such as David Humphreys, who personified a fusion of nationalism, agricultural innovation, manufacturing prowess, city-founding, and moral leadership.

Dwight's *Travels* provides both an extraordinarily rich source of empirical information for historical geographers and an egregiously ideological exemplar of the "symbolic landscapes" that preoccupy cultural geographers. In its empirical descriptions and its partisan special pleading can be discerned a landscape distinctive to the Federalist northeast. As a measure of how divergent from agrarian republicanism and how pro-urban this worldview was, we may note that Dwight is sometimes willing to make an almost unthinkable inversion (or rather, a re-version to the Augustan age). He sometimes suggests that cities are morally superior to rural areas. Thus, based on his observation of a decline of commerce on the Sabbath because locals increasingly see it as "an indecent intrusion," Dwight sweepingly concludes:

> The morals of Providence are probably superior to those of any other town in this state [Rhode Island]. The usual order of things with respect to morality seems here to be inverted. In most other states the country is more virtuous than the city (Dwight 1969, 2: 17).

This sequence – penetrating observation followed by entirely disproportionate magisterial generalization – is entirely typical of Dwight. Along with the sheer magnitude of his *Travels* project, it is this combination of acute observation and dogmatic ideological reconstruction that render his work such an interesting moment in the history of American symbolic landscapes.

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Notes

1. All references to the work of Thomas Jefferson are from the Thomas Jefferson Digital Archive, University of Virginia, http://etext.virginia.edu/jefferson/ (last accessed 4 May 2009).
2. All references to *Travels* cite page numbers in one of the four volumes, indicated by a Arabic numeral, of the edition edited by Barbara Solomon.

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ARNOLD GUYOT AND HUMBOLDTIAN SCIENCE

In Mid Nineteenth-Century New England

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ABSTRACT

This article examines Arnold Guyot's (1807-1884) studies of the physical geography of New England within the concept of "Humboldtian science." After a brief explanation of that framework, it discusses Guyot's work on the Smithsonian Institution's meteorological project and his measurement of the heights of New England mountains and their written and cartographic display. Guyot is shown to be a full participant in and a leading practitioner of Humboldt's methods during his New England years.
Keywords: Alexander von Humboldt, Appalachian mountain system, Arnold Guyot, Joseph Henry, Smithsonian meteorological project.

Arnold Henri Guyot (1807-1884) is perhaps best remembered today as the author of *Earth and Man* (1849), a book based on the lectures he delivered early in 1849 in a hall of the Marlboro Chapel, the Lowell Institute's venue in central Boston. Guyot had been self-exiled from Switzerland in 1848 when the Grand Revolutionary Council of Geneva had invaded the nearby city of Neuchâtel and closed the Academy and College, where Guyot had been employed as Professor of Physical Geography and History since 1839 (Ferrell 1981; Koelsch 2008a, 2008c).

Guyot's teaching, as set forth in *Earth and Man*, in his lectures for teachers' institutes and normal schools in Massachusetts and New Jersey, and in much of his later series of elementary textbooks, both refined and extended the teaching ideas and methods he had learned from his primary mentor, Carl Ritter of the University of Berlin, under whom he had earned the Ph.D., *summa cum laude*, in 1835 (Koelsch 2008c). Guyot had not been enrolled at Berlin during the winter session of 1827-1828, when Alexander von Humboldt gave his famous course of lectures on physical geography at the university that served as the basis for his monumental five-volume work, *Cosmos*. Guyot did encounter him in the university's precincts, however. For instance, he found Humboldt in August Bockh's classroom, where they both heard lectures on philology and Greek archaeology. We know that Humboldt also attended Ritter's lectures at Berlin (Libbey 1884, 198; Sandys 1964, 3: 95-101; Wilson 2005, 37). Although Guyot was not a protégé of Humboldt to the same degree as his friend Louis Agassiz, during his stay in Berlin Guyot received a modest amount of Humboldt's interest and patronage. Guyot's dissertation at Berlin, dedicated to Humboldt and Ritter jointly, reflects his appreciation of both.

Most commentators on Guyot have stressed, sometimes to the point of exclusivity, his appropriation of Ritter's ideas on human-environment relations. Though Humboldt's ideas are not so obviously significant as Ritter's in Guyot's intellectual development, as Philip Wilson

has shown it is evident in *Earth and Man* which, Wilson argues, is a selective synthesis of both (Wilson 2005). And in his own scientific work Guyot adopted Humboldt's interests and methods, particularly those in hypsometry and climatology, to a significant degree. At the American Geographical Society's Humboldt commemoration in 1859, Guyot pled for a continuation of Humboldt's scientific legacy in the New World, using "the careful methods that he taught us." Perhaps the relationship of the two in Guyot's mind was best expressed in the oft-quoted passage from his memorial address on Carl Ritter: "Humboldt furnishes the means; Ritter marks the goal" (Guyot 1859, 244; 1860, 63).

"Humboldtian Science" as Nineteenth-Century Practice

The term "Humboldtian science" was first used by the historian of exploration William Goetzmann to suggest a set of activities involving the patient accumulation of facts assembled in the hope that general laws would emerge (Goetzmann 1959, 18-19, 422, 423). The late Susan Faye Cannon, in an important book on early Victorian science, redefined the term as a practice that would eventually lead to laws through accurate measurement and the associated improvement of instrumentation, arguing for replacing the term "Baconian science" as a better description of nineteenth-century scientific practice. Cannon pointed out that not only did the latter term misrepresent Francis Bacon's own work, but that there was need for a new term that would identify more precisely the complex of interest and practices that, in its own time, was often called "physical geography" and which Humboldt had termed the "physics of the earth" (Cannon 1978, chap. 3).

Humboldtian science, as Cannon conceived it, "includes astronomy and the physics of the earth and the biology of the earth all viewed from a geographical standpoint, with the goal of discovering quantitative mathematical connections and relationships – 'laws,' if you prefer, although they may be charts or graphs" (Cannon 1978, 77). Cannon noted that Humboldt did not pretend to have invented all parts of this system. Improving the accuracy of portable instruments, for example, had been a concern of scientists long before Humboldt. But, she argued, Humboldt's contribution lay in "elevating the whole complex into the major concern of professional science for some forty years or so." Under this rubric she included the scientific pursuits of American scientists Alexander Dallas Bache, head of the Coast Survey; the physical geographer and oceanographer Matthew Fontaine Maury; Joseph Henry of the Smithsonian Institution; Harvard botanist Asa Gray, and other figures associated with scientific expeditions and state geological surveys (Cannon 1978, 74, 77).

"Humboldt's creed was measurement," Cannon asserted. All elements of the environment that varied geographically needed to have those variables precisely measured. These variables must also be related to one another in space and time, as well as to their local ecologies. Thus the distribution of plants must be related to variations in soil, degree of sunlight, latitude, altitude and other conditions of growth. Also, though Humboldt's ultimate aim was a search for governing laws of nature, he was quick to recognize that such laws could not be achieved in one man's lifetime, which bothered him no more than it did his nineteenth-century followers (Cannon

1978, 80, 87). In pointing out these characteristics of Humboldt's geographic approach to natural phenomena, Cannon fundamentally changed the ways we look at the scientific generation of his time.

Scholars writing subsequent to Cannon's seminal essay have used the concept to illuminate the work of Charles Darwin and other English-speaking scientists (see, e.g., Nicolson 1987; Home 1995). In a thought-provoking book linking literature and science, Laura Dassow Walls has contended that Henry David Thoreau was a Humboldtian as well (Walls 1995). Some, notably Humboldt scholar Michael Dettelbach, have attempted to extend the concept of Humboldtian science itself. Dettelbach has pointed out that Humboldt's view of the physical environment depended more upon complexity than upon a purely mechanistic approach. It depended on both "the greater the number of forces observed and accurately measured, and the greater the extent of the earth's surface such measurements covered..." Particularly important to Humboldt was meteorology, which with the aid of the isothermal lines he developed would show the influence of global forces acting locally; barometric measurement of altitudes and the construction of maps displaying variations in topography; and the geographical distribution of plants. Humboldt also recognized the importance of "an organized network of observers ...dispersed over large expanses of the earth's surface, using comparable instruments and standard protocols" (Dettelbach 1996, 291, 295-99). This approach was most notable in the cooperative research he stimulated on terrestrial magnetism (Cawood 1977), but is also marked in the Smithsonian network of meteorological observations, in which Guyot played a prominent role.

Cannon pointed out the contrast between Humboldtian science, "the accurate, measured study of widespread but interconnected real phenomena," and the restrictive framework of laboratory science. Humboldtian science depended upon a worldwide system of accurate observations of phenomena that could become part of the process of scientific generalization. By 1830, the year Guyot matriculated at Berlin, this was the arena of the scientific avant-garde (Cannon 1978, 105).

The Measurement of Atmospheric Phenomena

Soon after Guyot's arrival in the United States in September, 1848, he and Agassiz set off for Philadelphia to attend the inaugural meeting of the newly organized American Association for the Advancement of Science. Here Guyot met several prominent American scientists, was elected to membership, and spoke at length with the physicist Joseph Henry, formerly of the College of New Jersey and, in 1848, the first Secretary of the Smithsonian Institution. Henry had a long-standing interest in meteorology, and, in his days as a teacher at the Albany Academy, he had compiled the meteorological reports submitted by the various academies making weather observations in New York. The Regents of the University of the State of New York had required these reports since 1825, when they had furnished thermometers and wind gauges to each academy and required them to keep records of their observations (Coulson 1950, 29-30; Reingold 1973, 140; Moyer 1997, 124-25).

In his first report (1847) as Secretary of the Smithsonian, Henry had called for a national system of meteorological observations, particularly to assist the study of the origins and charac-

teristics of storms. His consultant, the meteorologist Elias Loomis, recommended beginning by reorganizing the New York state system, equipping twenty academies with barometers and other instruments should they not have their own, and requiring reports of observations to the Smithsonian, following standardized instructions and reporting forms (Henry 1848; Coulson 1950, 195-96; Fleming 1990, chaps. 4, 5). Under these circumstances, the arrival of a scientist with extensive experience with barometric instruments, and who had previously set up a network of weather stations in Switzerland, must have seemed providential to the staunchly Presbyterian Henry. After the New York state legislature had approved and appropriated funding for the plan, Guyot was employed to order the instruments, plot the distribution of stations, and design registration forms and an instructional manual. Rejecting the instruments formerly employed in New York, Guyot had the New York instrument maker James Green manufacture a new cistern barometer reflecting the best current European standard, the Fortin, as modified by Ernst. Guyot and Green made further modifications in the interest of reliability and transportability. The result was the so-called "Smithsonian Barometer" (Middleton 1964, 345-48; 1969, 16-18; Fleming 1990, chap. 6).

Having divided the state into orographic regions in order to locate the best sites, Guyot spent November and December establishing seventeen stations along the storm track from Buffalo to New York City, teaching the observers the use of the new instruments, and determining barometrically the elevation of each station. He also placed barometers and wind-vanes in telegraph offices in the principal cities, thereby creating a record of pressure, wind direction, and other factors to be transmitted daily to the Smithsonian and to warn coastal cities of approaching storms. Armed with copies of his newly published pamphlet, *Directions for Meteorological Observations*, Guyot returned to New York in July 1850, revisiting the older stations and establishing twenty-one new ones, equipping a dozen of them with psychrometers to measure relative humidity.

Guyot's work in New York furnished him with an income, a model, and material for a series of scientific papers given to the American Association for the Advancement of Science and to the Boston-based American Academy of Arts and Sciences (hereinafter "Academy"), to which he had been elected in January 1849. To the latter group, in 1851, he used the opportunity of a tornado in Middlesex County to propose a new theory of tornado genesis. He also served on several Academy committees, including one advocating the metric system for barometric measurements (Academy 2: 236-37, 243-44, 269-70, 284-85, 289-91).

More importantly, Academy sponsorship helped Guyot and Henry persuade the Massachusetts legislature to establish a network of weather stations in that state similar to the one already launched in New York. At the Academy meeting of 6 February 1850, Guyot described his work in New York and moved the appointment of a committee to consider Massachusetts' cooperation in the Smithsonian network. Unsurprisingly, since Guyot chaired it, the committee reported favorably on the idea. The Academy then appointed another committee, chaired by the distinguished Harvard mathematician Benjamin Peirce, with Guyot and the influential Dr. Henry Ingersoll Bowditch as the other members, to petition the legislature for that purpose (Academy 2: 198-99, 220).

Ten days later, the trio formally petitioned the legislature to appropriate funds to purchase and install instruments at twelve to fifteen stations across Massachusetts. In addition to laying out the scientific justification, Peirce's committee argued the benefits of the scheme to commerce, agriculture, and public health, as well as to education, since under the plan the major academies, colleges, and normal schools would take part in making observations. Accompanying the proposal was a list of seventeen proposed stations (in Guyot's handwriting), together with a list of the equipment proposed for each. As he had done in New York, Guyot grouped the stations by physical region.

The Committee on Education, to whom the memorial was assigned, reported it favorably, and on 25 March, the Massachusetts legislature authorized the Governor to designate not more than twelve stations, one each to be located at the three colleges in the state (Harvard, Amherst, and Williams), and three of the others at the state normal schools at West Newton (now Framingham State College), Bridgewater, and Westfield. The legislature also authorized an appropriation from the state's School Fund of not more than $100 per station. Governor George Briggs did not designate the stations until January 1851, his list differing somewhat from Guyot's. He requested that the Smithsonian take charge of the project in cooperation with the Academy (Koelsch 1966, 76-78).

Henry again engaged Guyot to supervise the construction of the instruments, establish the stations, and train the observers. All instruments had been constructed and six stations were established by the end of 1851; four more began operations the following year. Outside the colleges and normal schools, however, Guyot had difficulty in recruiting willing observers, and on completion of the system in the fall of 1852, he recommended compensating them for their work. In that year he had also produced a set of meteorological tables that, subsequently revised and expanded to include physical tables, was to be reissued well into the twentieth century. But as J. R. Fleming has shown from his analysis of the original Smithsonian reports, observations at many Massachusetts stations were intermittent, short-lived, or both. Only six stations were still reporting as of March 1853 (Fleming 1990, 122). In April, 1854 the legislature authorized and the governor approved an annual payment of thirty dollars per year to each observer. In the same month another noted observer of nature, Henry Thoreau, noted in his journal that "It is remarkable how the American mind runs to statistics," citing among other evidence the meteorological observers in the then infant Smithsonian system (Entry for 17 April 1854, in Thoreau 1906, 6: 200; Koelsch 1966, chap. 2).

In his meteorological work in New York and Massachusetts, then, Guyot was doing more than simply establishing a proto-weather service, though he and Henry have often been justly praised as the precursors of the post-Civil War national weather system. Individual Americans had been making weather observations for many years (see, e.g., Brown 1940). But, as Mildred Berman has said of her subject, weather observer Dr. Edward Holyoke, "he distrusted fancy hypotheses" (Berman 1986, 238).

Guyot was doing something different from such earlier observers as Holyoke; he was applying Humboldtian principles to such problems. Humboldtian scientists were interested in gathering empirical data that would show variations over the earth's surface, selected in order to advance the process of developing the sciences through the testing of hypotheses, which

would eventually develop into general theories or "laws." Guyot emphasized precise and up-to-date instrumentation, the creation of networks of observations to predict the weather and to establish, it was hoped, a "law of storms." In these, and in such other activity as trying to work out a general theory of tornado genesis, as well as in Guyot's placement of stations in relation to carefully measured altitudes and in the context of topographic regions, we can see examples of the methods Humboldt himself had practiced or advocated.

Guyot and New England Topography

As indicated earlier, another part of the Humboldtian practice was the precise measurement of variations in topography, especially the heights of mountains, and of accurate mapping of those measurements to display the variety of terrain over the earth's surface. In his Boston lectures of 1849, Guyot had credited Humboldt with being the first to recognize the importance of topographic mass, as revealed through his barometric measurements of altitude in Latin America. Guyot himself had devoted one lecture and part of another to the importance of relief (Guyot 1854, 54-55; Wright 1958, 10; Wright 1966, 140-41). He had a great deal of experience in barometric measurement of the heights of the Swiss Jura and other European mountain sites, ever since he took his first barometric observations from the Leaning Tower of Pisa in 1837 (Libbey 1884, 199-200). Soon after his arrival in the U.S., Guyot began assembling available data on the altitudes of the Appalachian mountain system. Confusion over place names and the errors suggested by comparison of widely varying published barometric measurements (in part because barometers used in the U.S. before his time were not often reliable) led Guyot to conclude that many new determinations were needed. Thanks to his work with Green in New York, he now had accurate instruments. Here, then, was a Humboldtian problem Guyot was uniquely equipped to study (Guyot 1861, 157-59, 163; Anstey 1960a).

From 30 July to 11 August 1849, Guyot and his nephew, the Gotha-trained cartographer Ernst Sandoz, who had accompanied his uncle to Massachusetts, made the first of what was to become a long series of summer expeditions to the New England mountains. In that brief period they made 204 hypsometric determinations. Between 1849 and 1852 Guyot and Sandoz ascertained the altitudes of 743 points in the White Mountains barometrically. In late August of 1857, Guyot's field party was the first to ascend that rugged peak, Mt. Carrigain. Guyot was then fifty years old and, as Laura and Guy Waterman have argued in their *Forest and Crag*, "it was a sensational climb for 1857." While establishing the Massachusetts stations, Guyot ascertained the elevations above sea level of 127 points, some barometrically and others by direct leveling from points previously established by railroad surveys or by the surveyors of the Massachusetts trigonometric survey of 1830, though he also accepted some of their earlier measurements (Guyot 1861; Chamberlain 1885, 138-39; Grant 1907; Waterman and Waterman 1989, 128, note a).

Guyot gradually extended his topographic surveys well beyond New England and, since almost all of his measurements were made by barometer, this meant he had to make these from the summit of each of the mountains he measured. Between 1862 and 1879 Guyot made numerous measurements in the Catskills, the last survey when he was approaching age seventy-two. He

also measured heights in the Adirondacks, in the southern Appalachians, in the Rockies, and in California. His former student, Charles Faure, estimated that in Guyot's lifetime he had made 11,862 hypsometric observations. His friend James Dwight Dana, who evidently had access to Guyot's field notebooks, estimated that Guyot's lifetime total was "over twelve thousand." Writing in the 1930s, Myron Avery called him "the most thorough explorer who ever penetrated the Appalachian Mountain system," and characterized his knowledge of the Appalachian system as "such as has never been possessed by any other person...." (Dana 1886, 342; Waterman and Waterman 1989, 130).

Guyot climbed and measured such famed New England landmarks as the major peaks of the Presidential Range, as well as Mts. Moosilauke, Moriah, Whiteface, Chocorua, Monadnock, Greylock, Wachusett, and many others. He gave several papers to the American Association for the Advancement of Science on hypsometric topics, such as his "White Mountain Measurements" at the Montreal meetings of 1857 (noted in Thoreau's *Journal*; see entry for 24 August 1857, Thoreau 1906, 10:13). But he apparently published only two of his papers dealing with the New England mountains. One of these, in 1861, was a preliminary survey and map of the entire Appalachian mountain system. In that article, he discussed his methods and instruments and, as a good Humboldtian, he attempted to establish a topographic "law" of its variation in altitude and relief. The accompanying map, which Sandoz had drafted in the Gotha Geographical Institute under the direction of A. H. Petermann and which had been initially published in 1860 in Germany, contained an inset map of the White Mountains. In the other published paper, on New Hampshire's glacial erratics (a subject of his earlier research in Switzerland), he argued that the White Mountains had been a center for their dispersal, a view confirmed by modern geology (Guyot 1861; Anstey 1960b; Waterman and Waterman 1989, 130).

A third important and related paper, on the Catskills (Guyot 1880), also shows a strong Humboldtian methodological influence. Several peaks across the country named after Guyot, such as Mt. Guyot in the Twin Range of the White Mountains, testify to the contemporary importance of his measurements of altitude. In those cases where his measurements have been checked, they are often, though not invariably, close to those obtained in more recent and more technologically advanced surveys (Wright 1958, 10; 1966, 151; Waterman and Waterman 1989, 127). In all these activities – going where no scientist had gone before, greater precision in instrumental measurement, explanatory description of the previously unknown segments of the earth's surface, attempts to formulate "laws" of relief, and accurate mapping, Guyot proved himself a worthy representative of Humboldtian science in New England.

Guyot left the region in 1855 to fulfill his duties as Professor of Geology and Physical Geography at the College of New Jersey (now Princeton University). In September 1857 he returned to New England to address the American Academy on New England's geographical features in relation to human settlement. Like much of Guyot's scholarly work, this manuscript memoir was never published. John Gorham Palfrey used it, however, as the source for his description of New England geography in the first volume of his *History of New England*, published two years later. Guyot also furnished hypsometric data, based on his own observations, for a map in that volume on "New England in 1620-1644." For the frontispiece to Palfrey's third volume, published in 1864, Guyot furnished the data for a more elaborate map, "New England in 1689," drafted by Sandoz (Academy 4: 5-6; Palfrey 1859, xvi, 9 note 1; 1864, vii; Anstey 1960b, 13).

Figure 1. Arnold Guyot's Map of New England in 1689 (Courtesy of Harvard University Map Library)

Conclusion

This article does not contend that Guyot alone introduced Humboldtian science to the U.S. American appreciation of Humboldt's scientific reputation dates to 1804, when, at the conclusion of his Latin American expedition, he was welcomed to Philadelphia and later entertained by Thomas Jefferson and others in Washington (Koelsch 2008b, 270-73). Explorers of the West, notably John C. Fremont, had attached Humboldt's name to numerous physical features; some seven mountains alone had been named for Humboldt by 1856. Several towns and counties also bore Humboldt's name. After the Humboldt centennial in 1869, German "Forty-Eighters" and others would name parks and erect statues in his memory (Belgum 2005; Mathewson and Sluyter, 2006). As Agassiz put it in his Humboldt centennial address in Boston, "Every schoolboy is familiar with his methods now, but he does not know that Humboldt is his teacher" (Agassiz 1869, 5).

Among the Harvard and other cutting-edge American scientists with whom Guyot came in contact after 1848, Humboldt and his methods were quite familiar. As Cannon pointed out, most of the major scientific researchers of the period were already practitioners of Humboldtian science, and several had participated in Humboldt's plan for an international network of observers of magnetism prior to Guyot's arrival. American publishers had issued editions of Humboldt's work in English translation since 1815, and Cambridge academics had reviewed these in scientific and general-interest journals. Indeed, by the 1850s, Humboldt had become such a celebrity that his opinions on American slavery, for example, were freely quoted, and Americans, including Harvard faculty and students, tried to include a visit to the aged scientist on their travels abroad. From 1847 onward, Humboldt's protégé Agassiz was ensconced in Harvard's new chair of Zoology and Geology, and indeed it was he who had encouraged Guyot to come to the United States (Koelsch 1966, 221-29; Koelsch 2008a; Wilson 2005).

Nevertheless, Guyot stands as a worthy example of Humboldtian science in New England. His meteorological and hypsometric work incorporated Humboldt's ideas and methods and served as an authentic demonstration of the merits of the approach. Guyot's insistence on accurate measurement and up-to-date instrumentation, his use of widespread scientific networks of observers of natural phenomena, his emphasis on the importance of topography and orographic regions, his use of precise forms of representation such as accurate mapping and naming, and his implicit contention that the study and the laboratory were inadequate as sites for studying the enormous and scientifically important variability of the earth's surface, all show his absorption of Humboldt's ideas.

Guyot's most widespread impact in the U.S. was probably his response to the need for new methods of and aids to instruction, an activity through which he made Ritter's name and ideas broadly familiar to American audiences (Koelsch 2008c). But it was not for nothing that Guyot placed Humboldt's portrait on the first page of his text on *Physical Geography*, published in 1873. In his successful attempts to develop the instruments and other materials for, and his active supervision of, the Smithsonian network of weather stations, and in his masterly program of measurement and exposition of the Appalachian mountain system in his New England years and beyond, Guyot was a significant figure among the American scientists of his time. Through

his use of Humboldt's methods, Guyot made important contributions to the practice of Humboldtian science in America, and made it possible, through the observers and students he trained, for others to do so. In so doing, he accomplished what another New Englander, John K. Wright, would have described as transforming "*terrae incognitae*" into "*terrae cognitae*" (Wright 1947; 1966), fulfilling in New England a portion of Humboldt's dream of an earth made more intelligible by the progress of measurement and instrumentation.

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WATER, SCIENCE AND HUMANS:

Exploring the Hydrosocial Cycle in the St. Francis River Watershed

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ABSTRACT

Water as a physical entity cannot be separated from society through which it flows. The concept of the hydrosocial cycle, although not fully theoretically defined, is premised on the idea that the circulation of water - as a linked physical and social process - brings to light wider political economic, social, and ecological processes. This paper asks: What can be learned about the nature of the hydrosocial cycle from an exploration of the socio-physical dualism inherent in a specific watershed planning process? In response to the Quebec Water Policy (2002), watershed organizations have sprung up in the province of Quebec. Each organization is mandated to develop, implement and monitor a local watershed management plan based on the principles of stakeholder dialogue and collaboration. One of these is the St. Francis River Watershed Committee, responsible for the 10,230 km^2 St. Francis River Watershed – the third largest of the 33 priority watersheds identified in the Quebec Water Policy. Based on document analysis, this study examines the activities of the Committee in its first five years (2003-2008). The findings of the St. Francis River watershed case suggest that issues of socio-spatial representation, information gathering and report writing, funding, and public recognition and involvement bring to light the explicit socio-physical dualism of watershed planning. The findings provide insights on how to collapse this dualism, and raise further questions for the emerging conceptualization of the hydrosocial cycle.
Keywords: watershed planning, participatory process, socio-spatial representation, Quebec

Introduction

The flow of water is driven by the force of gravity as well as by the decisions made by humans through social, political, economic and legal systems. While the term "hydrological cycle" has been well established for decades to denote the movement of the water molecule through the Earth's biophysical systems, the term "hydrosocial cycle" is being applied by social scientists to emphasize the social dimension of water as it cycles through these linked biophysical and social systems.

Water as a bio-physical entity, it is argued, cannot be separated from the society through which it flows. Rather the two are merged seamlessly into a single unit - the hydrosocial cycle.

This perspective allows the researcher to collapse the dualism that distinguishes nature from society. The concept of the hydrosocial cycle is premised on the idea that "the circulation of water-as a physical and social process-brings to light wider political economic, social, and ecological processes" (Swyngedouw 2004). Budds and Linton (2009) argue:

> Considering water as a socio-physical process makes it impossible to abstract water from the social circumstances that give it meaning and from the social and ecological relations that get consolidated in material flows of water. At the same time, attending to the social dimensions of these flows provides a means of analysing water's political nature so as to promote/facilitate change in what is often taken to be a fixed set of circumstances.

The concept of the hydrosocial cycle opens up new frontiers for the understanding of society-environment relations that remained fairly unexplored until now, especially exactly how social and ecological relations get consolidated in the material flow of water. This study takes up that challenge by asking the question: What can be learned about the nature of the hydrosocial cycle from an exploration of the socio-physical dualism inherent in a specific watershed planning process?

Based on a review of documentation produced by the watershed planning efforts in the St. Francis River Watershed in the southeastern corner of the Canadian province of Quebec, the purpose of this paper is to explore what socio-physical dualism exists in watershed planning activities and how we may begin to collapse the water-society dualism for more appropriate understanding of the environment. It does so by reviewing the work of the St. Francis Watershed Committee over the past five years and examines issues of representativeness, funding, and public recognition as helpful for expanding our understanding of the hydrosocial cycle in general, and for watershed planning in particular.

The Hydrosocial Cycle: An Emerging Concept

The term "hydrosocial cycle" is a relatively new one, having been invoked by a number of researchers who are exploring water's social and biophysical relationships. For example, Merrett (1997) has examined the social and biophysical in an examination of the engineering and economics of water delivery and treatment systems in urban areas. Bakker (2007) investigated the legal, management, and ethical issues associated with water delivery and use. However, neither of these writers included any expanded discussion about the nature of the hydrosocial cycle and its potential for understanding human-environment relationships.

Falkenmark and Rockstrom (2004) explained how water flow links nature and society through water's many parallel functions as the 'blood stream' of both the biosphere and the imbedded anthroposphere, and the resulting conflicts that arise. Yet their perspective was one of examining trade-offs between human and environmental needs, perpetuating a dualism between water's physical and social processes.

Scholars from science studies have moved beyond critiques of positivist natural science to consider the participation of more-than-human entities in scientific practice and in the produc-

tion of scientific knowledge. Geographers Noel Castree and Bruce Braun (2001) and David Demeritt (2001, 2002), long interested in the social construction of nature, have tried to define and explain the nature-society interface and have reflected upon the repercussions of this dualism upon society and decision-making. These perspectives converge in a shared concern with the deployment of scientific nature in political and administrative discourse and an interest in theorizing natures that are politically-responsive (Budds and Linton, 2009).

Meanwhile, political ecologists are exploring the politicization of environmental change. By becoming an object of decision-making, nature takes on a political aspect. Thus the urgent need to resolve conflicts over forests, fisheries, farming practices, urban sprawl, among others, calls for a critical rethinking of democracy, citizenship and of nature itself. In this light, Adkin (2009) recently documented sixteen case studies of environmental conflict in Canada, all of which question "how democratic aspirations can push back against the tight policy monopolies that control the environmental agenda in Canada".

Water, as a political object, is increasingly the focus of academic attention. Drawing from a social theory perspective, Swyngedouw (2004) critically examined the flow of social power through the water delivery system. His long-term, in-depth research in Guayaquil, Ecuador on the complex relationships that constitute urban natures provides insights into the study of water ecology within its political economic context. He lays the foundation for the rethinking of water, nature and society by theoretically linking them together, revealing a perspective on the flow of urban water that cannot be disassociated from its social and political and economic agents.

Budds (2009) examines how the idea of water flows as inherently cyclical became historically embedded in the concept of a "hydrological cycle", and the extent to which the observed water flows may also have been influenced by societal ideas about how water should behave. Drawing on insights from political ecology as well as natural science literature on hydrology and modeling, and based on an examination of physical water resources assessment undertaken in a Chilean river basin, she critically reflects on how the notion of a cycle in hydrological science became popularly accepted. Her work provides a basis for critical analysis and development of the notion of a cycle within the emerging concept of the hydrosocial cycle.

Despite, and perhaps as a result of, these diverse approaches, the literature on the concept of the hydrosocial cycle is still in its infancy, remaining vague and theoretically undefined. In attempting to bring the wider aspects of the hydrosocial concept to the forefront, the 2008 Annual Meeting in Boston of the Association of American Geographers included an afternoon of special sessions, organized by Jessica Budds and Jamie Linton, entitled "Water, Science, Humans: Adventures of the Hydrosocial Cycle[1]. The paper presentations which followed, authored by researchers working in five continents and representing a dozen disciplines, also revealed a wide diversity of empirical findings and theoretical approaches. Each stemming from an interest in how science is used in environmental decision-making, the presentations showed members of the audience how various social network analysis tools were coupled with a variety of data gathering methods – surveys, document analysis, field studies, and personal interviews - to explore the role of social networks in the flow of scientific understandings amongst civil society groups and other actors in the area under investigation.

In this emerging field of study, there is no singular conceptual framework which leads to an

agreed explanation of the variety of empirical results – there is no tested theory of hydrosociology that applies to all cases. Yet, through these research projects, an umbrella of knowledge is being formed over what is being called the hydrosocial cycle, serving to frame a deeper understanding of it built upon this diversity of theoretical foundations. In the same vein as the studies presented at the Boston meeting, the St. Francis River case discussed in this paper serves to explore the explicit dualism that exists in watershed planning. By bringing to light and analyzing how the separation of biophysical and social components have prevailed in the St. Francis watershed planning case, we can reflect on what that separation means and how watershed planning can be improved.

The Quebec Water Policy

The Quebec Water Policy was launched in November 2002 as a result of an extensive public consultation process to gather public opinion in every region of the province (BAPE 2000). The report dealt with such key water issues such as water treatment, health, exploitation of groundwater, aquatic habitats, privatization of water services, water pricing, water exports and watershed-based planning. These efforts served to provide the general orientation for substantial policy development which became the Quebec Water Policy. The first orientation of the Quebec Water Policy stipulates that water governance must be reformed. It states:

> This reform involves the development and enunciation of a shared, comprehensive vision of water resources to ensure consistent implementation. It aims for an evolution of the existing system of governance, particularly through greater participation by the different water users in both decision-making and the various actions resulting from these decisions (Quebec Water Policy 2002, 15).

In order to facilitate the development of a "shared comprehensive vision of water management", one of the government's major commitments has been related to implementing watershed-based management for thirty-three major watercourses located primarily in the southern, most populated portion of the vast province. At the local and regional levels, watershed organizations are responsible for implementing integrated management, from a sustainable development perspective, by preparing a Watershed Plan for the entire watershed which includes watercourses, lakes, marshes and other wetlands, as well as aquifers within the boundary of the watershed (Quebec Water Policy 2002, 19).

Although the principles of integrated watershed management are practiced in many parts of Canada and the world, this new policy orientation was the first in Quebec. The government chose a hybrid structure, or "collaborative" model of watershed management, which differed from the strictly government-directed or citizen-directed models seen in other places. Each watershed organization was to be composed of members who have agreed to collaborate and act jointly on behalf of all water management players and other interested parties. Although these watershed organizations have no legal authority to make statutory decisions (that responsibility remains with the Minister of Environment), their role of deliberative planning tables were

aimed at enhancing a more participatory decision-making process toward sustainable water governance in the province. The government's commitment to sustainable water governance relied heavily on developing a shared vision among the disparate groups at these watershed planning tables that are maintained, funded and supervised by the government and responsible for implementing watershed plans. The Quebec Water Policy (2002, 22) also recognized "the constant need for information, knowledge, and research in support of the decision-making process". To support these information gathering needs, the government promised to "assemble and develop the information on water and aquatic ecosystems essential for water governance" (Quebec Water Policy 2002, 24) through a number of initiatives which included designing and developing an information system of water-related data in various government departments, and by creating a network of government and university-based water experts for the exchange and distribution of water-related information.

Essentially, according to the policy, these newly-created watershed organizations would form the central means by which local groups and citizens could become involved in water governance reform, obtain information about the quality of their watersheds, and form the primary means by which this anticipated water governance reform would actually take place.

The St. Francis River Watershed

In exploring the efforts of these newly-created watershed organizations and the goal of moving toward sustainable water governance reform in the province, a case study was chosen where the activities of a watershed committee and its knowledge about the biophysical aspects of the watershed itself was sufficiently advanced to produce a useful exploration of the hydrosocial cycle at work. Consequently, the St. Francis River Watershed was chosen.

Description of the St. Francis River Watershed

The St. Francis River Watershed is situated south of the St. Lawrence River, encompassing an area of 10,228 km^2 in southern Quebec bordering the states of Maine, New Hampshire and Vermont (Figure 1). Fifteen percent of the watershed is located in Vermont.

The St. Francis River Watershed is the third largest of the thirty-three priority watersheds identified in the Quebec Water Policy. There is a large diversity of topographic, hydrologic and ecological characteristics within the watershed. In its higher elevations in the eastern portion close to the Maine border is found Lake St. Francis, source of the St. Francis River which forms the principal waterway of the watershed. In this highland area, forests cover the mountains and hills. In its middle reaches flow several major tributaries which drain the mixed forest and farmlands to the south, including those in Vermont and contains the main urban centre of Sherbrooke. The lower section, where the river drains into the Lake St. Pierre in the St. Lawrence River, is lowland dominated by farming activities.

The demographic variation is also pronounced. The St. Francis River Watershed touches on three major administrative regions, Centre-du-Québec (11 %), Estrie (80 %) and Chaudière-

Appalaches (9 %), which includes 102 municipalities, twelve counties, and the city of Sherbrooke. In total, the watershed contains an estimated 350,000 inhabitants, about 5% of the population of the province (COGESAF 2006).

The St. Francis River Watershed Committee[2]

Early in 2002, municipal governments, environmental organizations, and agriculture, forest and commercial resource sector representatives gathered to form a provisional watershed committee recognizing that the provincial government would soon be handing down its Water Policy. The provisional committee spent the first several months giving presentations in several cities of the watershed, explaining the central objectives of the new provincial Water Policy and its role as a multi-stakeholder planning organization. Its mission and objectives were largely taken directly from the Water Policy documents, in that it supported the government's movement toward water governance reform and the central role that watershed committees would play in this reform.

Following its formal acceptance by the provincial government in the spring of 2003, the St. Francis River Watershed Committee (SFRWC) was formally charged with developing a Watershed Plan for the St. Francis River, and provided a one-year grant of $65,000 which was renewable annually. Its planning meetings are held every second month, and an Annual Meeting is held each year in April.

Examining the Work of the SFRWC: Implications for the Hydrosocial Cycle

Having completed five years of activities, the SFRWC's record serves to reveal the biophysical and social processes at work contributing to the emerging understanding of the dynamics of the hydrosocial cycle.

Socio-Spatial Representation

According to its mission statement, the new watershed organization was required to facilitate open dialogue and cooperation between all the water interests acting in the territory of the watershed, and with members of the general public (COGESAF website). One of the first challenges of the provisional group was to design the composition of the committee members which would fairly represent all the water interests acting in the territory of the watershed. The provisional committee, having organized itself prior to the adoption of the Water Policy, had initially been assembled by word of mouth and by personal invitation without government involvement. As it soon became clear that the new organization would become officially recognized by the provincial government, the provisional committee moved to design its full composition based on fair socio-spatial representation. This goal presented the provisional committee with a sizable challenge, given the biophysical size and diversity of the watershed and its demographic characteristics.

Figure 1. Location of the St. Francis River Watershed, Quebec, Canada
Previously published in Castonguay (2007, 822). Used with permission.

The provisional committee created three local interest sectors: local government sector (e.g., mayors and municipal councilors); economic sector (e.g., those working in the fisheries, agriculture, and forestry sector); community sector (e.g., environmental groups, tourism and recreation groups, and education and cultural institutions). They also divided the territory into three sections (Upper, Middle and Lower sub-watershed), and sought equal representation from the electoral colleges in each sub-watershed.

In April 2003, the first Annual meeting as the newly-formed government-support organization included a board of 31 volunteer members, elected by their constituent groups, as follows:

- 9 elected municipal government officials (3 in each sub-watershed)
- 9 representatives from education, recreational and local environmental sectors (3 in each sub-watershed)
- 9 representatives from agriculture, forestry and commercial sectors (3 in each sub-watershed)
- 3 representatives from the regional environmental coalitions (1 in each sub-watershed)
- 1 First Nations representative (for the entire watershed)

From a hydrosocial perspective, the linkages are noticeable between societal actors and biophysical characteristics of the watershed. Each sub-watershed in which water flows necessitated, and achieved, adequate representation on the watershed planning committee. Rather than provide representation based solely on social factors such as population base or sectoral interests, the committee sought to allow the water regions themselves, or sub-watersheds, to have their own spatial representation based on topography. Further, in 2007, the organization changed its name from (translated) "St. Francis River Watershed Management Committee" to "Water Governance Council for the Watersheds of the St. Francis River" to reflect this new reality. This change explicitly reduced the focus of planning to the sub-watersheds while allowing an overarching committee, now called council, to oversee the planning process.

While fair democratic representation in environmental participatory planning processes, including watershed planning and management, has been the topic of much academic inquiry (e.g., Renn, Webler and Wiedermann 1995), little attention has been placed on socio-spatial analysis of representation in watershed planning. In seeking to represent the St. Francis Watershed socio-spatially, representatives were charged with not only speaking on behalf of their social constituents (e.g., their sectorial social interests) but also on behalf of the spatial and bio-physical characteristics of the sub-watershed.

Watersheds, by their very nature, combine topographically-based hydrologic features and people who inhabit them. Consequently, they could be conceived as coupled social-biophysical systems which require representation of both social and biophysical features for appropriate planning and management. This coupling occurs in a highly complex, potentially unpredictable and risky manner, including the growing scale of the ecological footprint of the human activities in the watershed and the implications of these activities downstream.

The promotion of socio-spatial representation in the watershed planning committee helps dissolve the dualism between water and society and blends them into one single hydrosocial cycle. The sub-watershed scale provides a means to remove the artificial divide between social and physical reality of the watershed. It tends to provide a more accurate focus for individuals involved in watershed planning because daily activities and knowledge base is usually more

extensive at this geographical scale.

The degree to which socio-spatial representation of the St. Francis River watershed case has moved beyond the nominal realm (the existence of elected socio-spatial representatives on the committee) to the substantive realm (the evidence of socio-spatial deliberations in, and outcomes from, the watershed planning process) is explored in the next section.

Information Gathering and Report Writing

Three years into its mandate, in May 2006, the SFRWC succeeded in producing a Comprehensive Watershed Analysis Report (COGESAF 2006). The 258-page report, filled with maps and charts and divided into two sections ("Portrait" and "Diagnostic") represents only the first step toward a Watershed Plan (COGESAF 2006). The "Portrait" contains basic descriptions of the characteristics at the scale of the entire watershed, and includes chapters on general features, land cover, land use, water usages, water quality and risks to human health. The "Diagnostic" describes the major water quality "hot spots" in the watershed, with each chapter relating to a specific sub-watershed.

In producing its Watershed Analysis Report, the SFRWC focused almost exclusively on inventorying the physical state of the watershed, and areas of major ecological concern. Ironically for the so-called "analysis" document, the report is primarily descriptive - there is no examination of the reasons for the areas of environmental concern, and the possible linkages with human activities that may be associated with, or causing, the environmental degradation areas outlined in the report. As such, the SFRWC seems to have framed the watershed as a hydrological phenomenon rather than a hydro-social phenomenon. In doing so, the SFRWC seems to have been incapable of analyzing the more social aspects of water quality. The socio-spatial representation of the committee members remained nominal in nature, maintaining a dualism between water and society, and effectively ignoring the social factors so closely tied to the hydrological conditions, such as reasons for water degradation and prospect for water quality improvements through changes in awareness, education and social practices.

This deficiency is partially explained in the Watershed Analysis Report's preface which is careful to point out to readers that the report is not complete and is based on the host of uncoordinated studies performed in the past which the authors were able to gather within the time and funding constraints they faced. Almost no updated primary information was gathered for the report. Nonetheless, the lack of resources for a more detailed report exacerbates the water-society dualism and enables the generation of technical information disassociated from the lives of people responsible for the water degradation.

From a hydrosocial perspective, even within the time and financial constraints it faced, more attention in the Watershed Analysis Report should have been placed on examining social phenomena in the watershed, such as a history of hydrosocial relations in, or an environmental history of, the watershed. Again, this lack of detailed attention is partially explained by lack of expertise and funding. The issue of funding is addressed in the next section.

Funding

To support its water policy reform, the Quebec provincial government provided each of the thirty-three priority watershed committees an annual funding grant of $65,000 for capital needs and operations. In doing so, the Quebec government recognizes that adequate funding is needed for watershed committees to enlarge the knowledge base of the watershed's hydrosocial system and fulfill its mandate to assist in the movement toward sustainable water governance reform in the province.

However, the funding almost exclusively ended up supporting the existence of the Committee, rather than any actual work performed toward fulfilling its mandate. Consequently, the watershed committees across the province needed to find other sources to support, with varying levels of success, their mandated tasks. More funding was required to hire biologists and geographic information systems specialists to perform the necessary data gathering and analysis needs toward producing a comprehensive and accurate Watershed Plan.

Further, the same amount of funding continued to be provided to each of the thirty-three priority watersheds despite the biophysical reality that the priority watersheds vary in size from 68 km^2 to 43000 km^2. The President of the SFRWC has repeatedly argued that the criteria of the watershed's biophysical scale should help determine the level of funding – in essence calling for spatial-based financial equity - claiming that the funding provided is insufficient for the 10,000 km^2 territory under the committee's mandate (Raiche 2007).

One may question how the funds required for watershed planning flow across biophysical and social systems. A hydrosocial examination is needed to investigate this area of spatially-based financial equity. The data needs for watershed planning are enormous, and this is especially true for large biologically and socially diverse watersheds such as the St. Francis River Watershed. When funding is spread equally across watershed organizations, it creates a bias in the system where larger watersheds are disadvantaged over other smaller watersheds. In the case of the SFRWC, mentioned above, the annual funding was used to maintain the committee's existence and to produce a descriptive hydrological report, without any consideration of the social linkages to the watershed's hydrological conditions. As such, the quality of the planning efforts may have been compromised by inadequate funding. Further hydrosocial analysis is needed to explore the funding support more thoroughly to illuminate the degree to which the provincial government is acting on its commitment toward sustainable water governance reform and encourage public recognition and involvement in its water reform. For example, one might explore the applicability of funding formulae that take into account both watershed scale criteria and demographic indicators – and search for means by which the provincial government can make more equitable funding decisions for the hydrosocial cycle.

Public Recognition and Involvement

The Quebec Water Policy mandated each watershed committee "to promote watershed planning and education among the larger public residing in the watershed; to raise awareness of, and education about, water resources; and to facilitate democratic participation with respect to man-

aging water resources" (Quebec Water Policy 2002, 6). The aim was to help citizens understand and actively participate in the government's emerging water governance reform.

The SFRWC made it possible for members of the public to join the committee as supporting members for a small financial contribution. Its annual meetings were open to the public and it advertised its activities widely in its website, in quarterly information bulletins and annual reports. It set up kiosks at several community events, and held annual golf tournaments to raise awareness and support for its activities. After the publication of it Watershed Analysis Report, the committee held public meetings in several cities of the vast territory to educate the public on the state of the watershed and to solicit opinions about priority areas of environmental concern to target in the development of the Watershed Plan.

Despite several efforts to improve communication, meetings were poorly attended and few people were aware of the SFRWC's activities. It continues to be plagued with low membership and low attendance to its public meetings. Likewise, fundraising initiatives like golf tournaments have not resulted in very substantial results (COGESAF website).

In attempting to explain this lack of public recognition and involvement in framing an understanding of the hydrosocial cycle, one needs to explore the relevance of the flow of water in the watershed to people's everyday lives. While it seems that the majority of people are able to make the connection between a healthy environment and their quality of life in a very general sense, more study is needed to explore how ordinary citizens relate their knowledge of their watershed, including those preparing plans which will affect them, with their quality of life. The flow of water through the consciousness of citizens, and the barriers preventing active involvement in watershed planning activities, is an untapped area of research for those studying the hydrosocial cycle. One might venture to explore how perceptions of watershed planning and management activities affect people daily lives. This would involved surveying residents on their awareness of the watershed they live in and the activities they perform that affect water quality.

Conclusion

In April 2008, a special session of the American Association of Geographers' Annual Meeting was held in Boston, aimed at discussing the hydrosocial cycle and its varied researchers, contexts, theoretical approaches, methods, results and interpretations. This paper, first presented at the AAG Boston, is aimed at adding to this ongoing dialogue on the emerging concept of the hydrosocial cycle.

The Quebec Water Policy was adopted in 2002 by the provincial government in order to begin the transition toward what it called its sustainable water governance reform. The central pillar of its reform was to be the creation of a watershed committee in each of the thirty-three priority watersheds in the province. One of these was the St. Francis River Watershed Committee (SFRWC) just north of the Vermont and New Hampshire border.

Based on a review of the planning activities in the St. Francis Watershed between 2003 and 2008, this paper uncovered some of the factors that perpetuate the water-society dualism that dominate watershed planning activities: (1) socio-spatial representativeness; (2) information gathering and report writing, (3) funding, and (4) public recognition and involvement.

For each factor, further research is needed to explore the feasibility of watershed planning that collapses the water-society dualism into a single hydrosocial cycle. For example: (1) can socio-spatial representation improve the quality of watershed planning decisions?, (2) Does more in-depth examination of social phenomena in the watershed generate a better understanding of hydrological conditions?, (3) Can more equitable funding decisions be made by applying funding formulae that take into account combined criteria on the bio-physical scale and demographic conditions?, and finally (4) Is there a significant relationship between watershed residents' awareness and education about water conditions and their perceptions of watershed planning activities?

No doubt, there are other factors to be examined and research questions to be asked. Because watershed planning rests heavily on research, it must be made clear that narrowly-defined hydrological research is insufficient, in itself, to provide substantive decisions. In order to make effective environmental decisions that are based upon an understanding of the complex nature of water flow, we need research that collapses the dualism between water and society. Such research will bring to light the wider social, economic and ecological processes that make up the hydrosocial cycle. This study of the St. Francis Watershed, although exploratory in nature, sheds light on some of the factors that define and reinforce the dualism between water and society. This paper is thus a starting point to begin further investigations of the hydrosocial nature of watershed planning. It has provided insights on how to collapse the dualism and raised further questions for the emerging conceptualization of the hydrosocial cycle.

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Notes

1. The 2009 Annual Meeting of the Association of American Geographers also included special sessions on the hydrosocial cycle.
2. The formal name (in French) is *Conseil de gouvernance des bassins versants de la rivière Saint-François.*

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AN ANALYSIS OF AIR TRAVEL AT BOSTON

In The Post-9/11 Years

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ABSTRACT

The U. S. airline industry suffered tremendously in the aftermath of the terrorist attacks on September 11, 2001. A number of factors, such as the brief shutdown of service, the fear of flying among the American public, and the inconvenience caused by the enhanced security check at airports, combined to aggravate an already troubled market. Using the Domestic Airline Fares Consumer Report data released by the U.S. Department of Transportation, this article analyzes the post-9/11 air travel activities at Boston Logan Airport. The major findings from this study include: (1.) Logan airport suffered heavily from the 9/11 terrorist attacks in passenger enplanements. It took more than two years for the passenger volume to restore to the pre-9/11 level. (2.) The drop in passenger enplanements in the aftermath of 9/11 was not accompanied by service cuts from the airlines. (3.) The link between air fares and flight distance was weak in the city-pair markets from Boston. The air fare landscape for travel from Boston is not uniform and air travel costs vary significantly among destinations. (4.) Competition at Boston Logan Airport fluctuated in the post-9/11 years. With the increasing presence of JetBlue Airways, the overall competition level increased with more intense competition concentrated in less densely traveled markets.
Keywords: Boston, air transportation, air fare, competition

Introduction

The year 2008 marks the thirty year anniversary of the passage of the Airline Deregulation Act as well as the seventh anniversary of the September 11, 2001 (hereinafter "9/11") tragedy. Both historical events have significantly influenced the progress and condition of the U.S. domestic air transportation market. The passage of the Airline Deregulation Act in 1978 denoted the beginning of airline deregulation which has been commonly considered as the single most important policy reform in the history of civilian aviation (Morrison and Winston 1986, 1995). Numerous studies have been conducted to assess the impact of deregulation (Borenstein 1992; Butler and Huston 1990; Goetz and Dempsey 1989; Goetz and Sutton 1997; Morrison and Winston 1986; Reynolds-Feighan 1998; Ruppenthal 1987). While different opinions exist regarding some specific details like estimation of total savings, deregulation has been widely

hailed as a success (Goetz 2002) – after more than a quarter century of deregulation, air travel passengers in general have enjoyed a larger network of connections, greater service choices, and lower fares (Gong 2006).

However, then came the terrorist attacks on September 11, 2001. No industry has suffered greater damage from the attacks than the U.S. airline industry (Ito and Lee 2005). In addition to the brief shutdown of airline service right after 9/11, the fear of flying among the public and the inconvenience to fly caused by the strengthened security checks at airports led to a sharp decline in air travel demand in the months following the attacks. A number of studies have been conducted to assess the impact (Giglio 2002; Goodrich 2002; Ito and Lee 2005; Lai and Lu 2005).

According to a report (USDOT 2006) released by the Bureau of Transportation Statistics, U.S. Department of Transportation (USDOT), air travel dropped quickly after 9/11 and then continued to drop for the following six months. Highway travel also dropped immediately afterwards but then leveled off in the following four months. In addition, people switched from air travel to highway travel over the six-month period after the terrorist attacks. Further analysis of the impacts on air travel also indicates that the actual Airline Revenue Passenger-Miles began to approach the forecasted values only from December 2004 (USDOT 2006).

While some of the obvious impacts were temporary, there may have been less conspicuous yet profound changes in U.S. travel patterns. To further examine the damage from the 9/11 attacks on U.S. domestic air travel and to attempt to detect any changing patterns at a detailed level, this article focuses on documenting and analyzing the impacts of 9/11 on air travel at one single yet important market – Logan Airport in the City of Boston, Massachusetts. Through analyzing the data of air travel to and from Boston from 2001 to 2007, this research looked into some key elements of air travel such as air fare, passenger volume, competition, and their changes in comparison with pre-9/11 levels.

Data

Well known as "The Hub" city, Boston is indeed an international hub of transportation. Being one of the busiest airports in the U.S., Boston's Logan airport has played an important role in regional, national, and international air travel. Although it is not a functional hub of any major airlines, it is connected (via direct and non-direct flight) to more than 300 destinations worldwide with more than 20 serving airlines[1]. Besides generating and attracting domestic traffic, Boston also functions as a pivotal international gateway for travel to Europe, Asia, and other parts of the world. With its important role in air transportation, any insight from examining Boston's air travel market in the post-9/11 years could shed light on the development of the entire industry.

The data used in this study were compiled from the 2000-2007 Domestic Airline Fares Consumer Reports released by the U.S. Department of Transportation. The Report is created based on a ten-percent sample of the actual individual passenger tickets information submitted by certificated airlines. It represents a relatively comprehensive and accurate description of air travel activities at the city-pair market level. The report has been issued quarterly since the fall of 1996 and initially for the 1000 largest city-pair markets in the contiguous 48 states. The 1000 largest

city-pair markets generally account for about 75 percent of all domestic passengers. Starting in the fourth quarter of 1998, the report coverage was expanded to include every city-pair market with an average of at least 10 passengers per day. Thus the recent data covers nearly all domestic air travelers.

For each city-pair market, the report lists the number of one-way passenger trips per day, the nonstop distance, the average market fare, and identifies the airlines with the largest market share and the lowest average fare; market share and average fares are provided for both airlines.

To examine the post-9/11 air travel activities at Boston, six years of Domestic Airline Fares Consumer Reports (2002- 2007) were obtained from the U.S. Department of Transportation[2]. For comparison with pre-9/11 conditions, the Reports for 2000-2001 were also acquired. All the report data were pre-processed in Excel so that only records containing Boston as Origin or Destination were kept for further analysis.

Analysis

Passenger Volume

Serving over 28 million passengers in 2007[3], Logan International Airport at Boston is one of the 20 busiest airports in the U.S. The Boston–Cambridge–Quincy metropolitan statistical area (MSA) ranks among the ten largest MSAs according to 2007 U.S. Census Bureau estimates with a population of 4.48 million. Being the largest city in New England, Boston is unquestion-

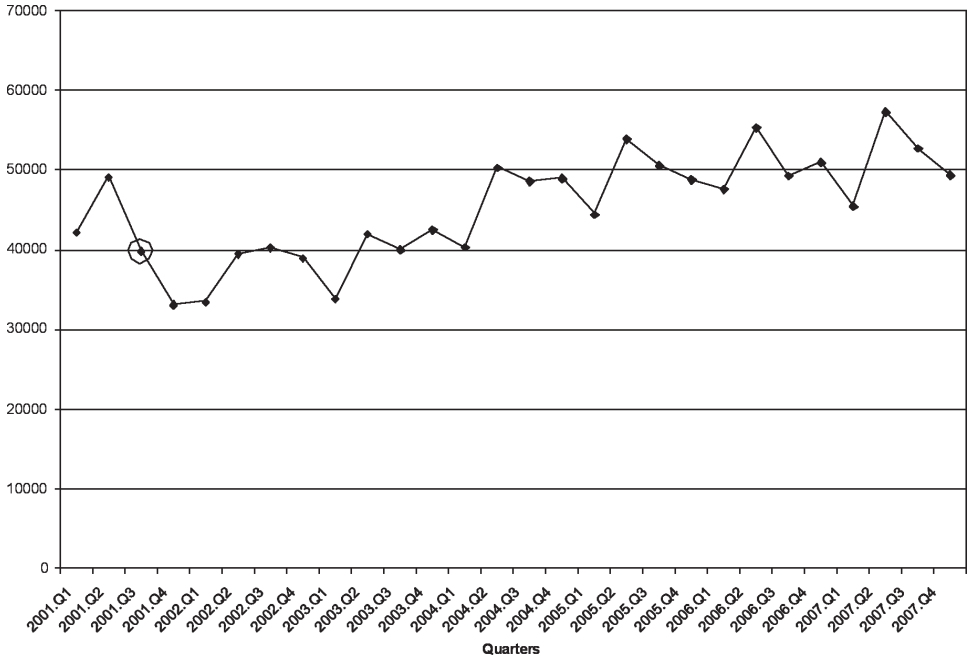

Figure 1. Average daily passenger volume at Boston Logan Airport, quarterly 2001-2007.

ably the economic and cultural center of the entire region. In 2008, 18.3 million domestic and overseas visitors were attracted to Boston[4].

The September 11 terrorist attacks had a serious impact on air travel at Boston Logan Airport. As shown in Figure 1, the number of average daily passengers plummeted abruptly in the third quarter of 2001 (emphasized by a circle in the chart) and the quarter that followed. Throughout the whole year of 2002, the average daily passenger volume failed to reach the level of the first quarter (usually the lowest season in a year) of 2001. Passenger volume in general peaks in the second quarter, but this did not happen in 2002. Compared to the pre-9/11 level (the second quarter of 2001), the second quarter of 2002 experienced a 20 percent drop in air travel passenger volume. During the same time period, other major international gateway cities also witnessed different degrees of falloff in passenger volume. Noticeably, Los Angeles saw a 23 percent decrease while San Francisco had 19 percent. Miami and New York City had relatively small amounts of reduction with 6 percent and 11 percent, respectively.

Figure 1 indicates that the passenger volume at Boston Logan Airport started to recover by the end of 2003. It reached the pre-9/11 level in the second quarter of 2004. In 2007, according to the Massachusetts Port Authority, Boston Logan served 28,102,455 passengers – a new airport record.

Accessibility

The number of city-pair markets is a good indicator of a city's accessibility. It measures how well a city is connected to the rest of the world via air transportation. Although the report used by this study only contains markets with a minimum of 10 passengers per day, thus not a complete list, it still reflects the general air travel accessibility of Boston.

As Figure 2 indicates, there has been a seasonal variation in the number of city-pair markets connected to Boston. This largely echoes the pattern observed with passenger volume only with the peak in the third quarter. Different from Figure 1 though, is the surprising lack of visible impact of 9/11 terrorist attacks. Together with the passenger volume pattern shown in Figure 1, it indicates that airline companies did not significantly cut city-pair connections in the aftermath of 9/11, however the consumers chose to travel less or as indicated by the U.S. DOT report (2006), sought the automobile as an alternative.

Air Fare

The dynamics of competition in the deregulated market for domestic air travel have given rise to a complex structure of fares (Anderson et al. 2002). In some markets fares are poorly correlated with travel distances and there may be a wide range of fares charged to the same destination even by the same carrier.

Using 2007 second quarter data as an example, Figure 3 plots the average air fares against the flight distance for 169 city-pair markets originating from Boston. Although in general air fares tend to be larger for long-haul flights, the relationship is not strong at all. This verifies the common assertion that in the post-deregulation period the link between air fares and distance

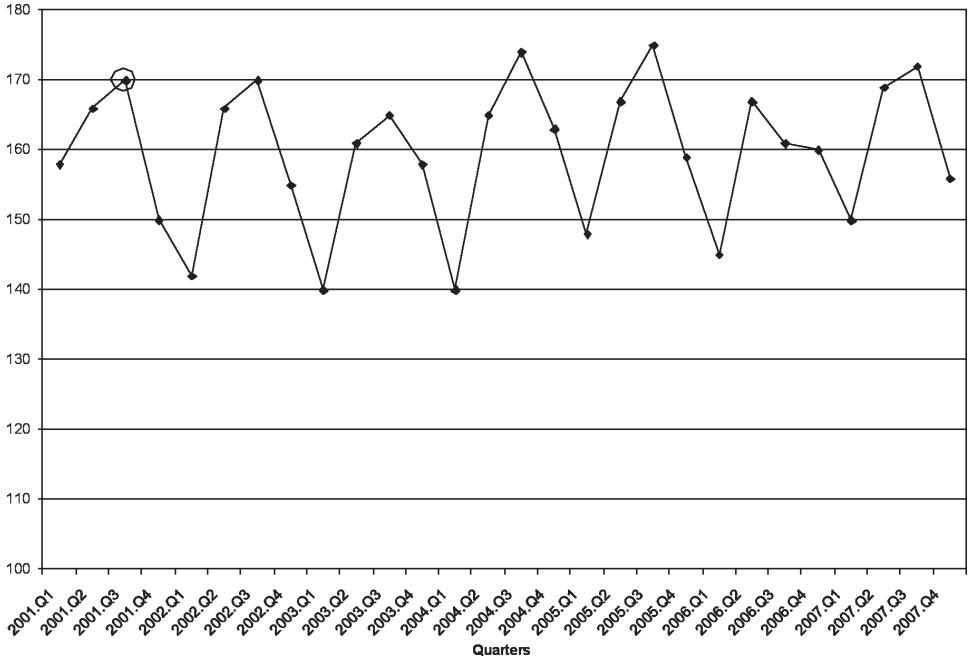

Figure 2. Numbers of city-pair markets at Boston Logan Airport, quarterly 2001-2007.

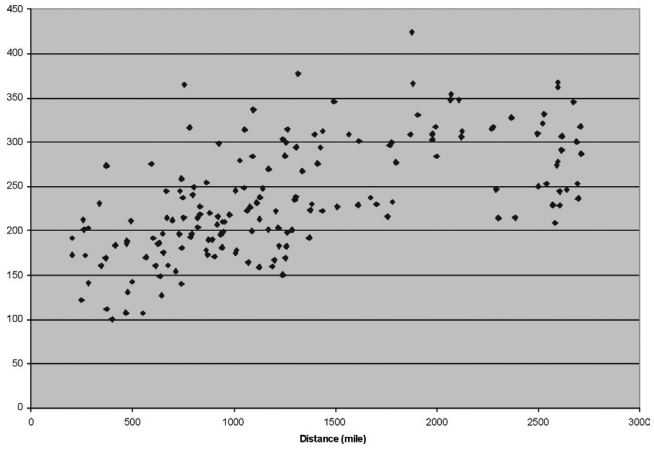

Figure 3. Average air fare versus flight distance for city-pair markets from Boston, 2nd Quarter 2007.

has broken down. For any flight distance, there exist a great variety of air fares.

Figure 4 plots the average yields (fare per passenger mile) against the flight distance using the same data. The chart clearly shows an inverse relationship between the two variables. This is consistent with the fact that on longer trips, fixed costs such as terminal charges can be spread over a larger number of miles, thus the average yields tend to be lower (Anderson et al. 2002; Borenstein and Rose 1994; Evans and Kessides 1993). Also worthy of mentioning is the rather sharp change in the slope at approximately 750 miles of distance.

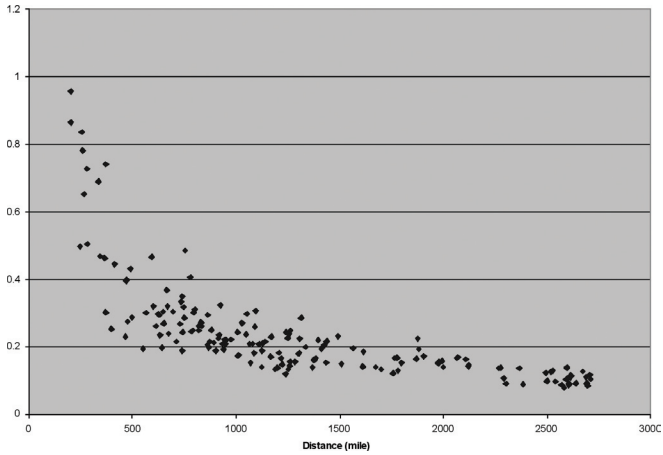

Figure 4. Average yield versus flight distance for city-pair markets from Boston, 2nd Quarter 2007.

This indicates that the effect is most pronounced for relatively short distance markets (less than 750 miles).

Geographically, Figure 5 depicts how expensive it is to fly to other cities from Boston using the fourth quarter of 2007 data as an example. In general costs are higher for longer trips – it costs more to fly to the cities along the west coast of the United States and in the Rocky Mountain region. However, several important exceptions exist. Cities in

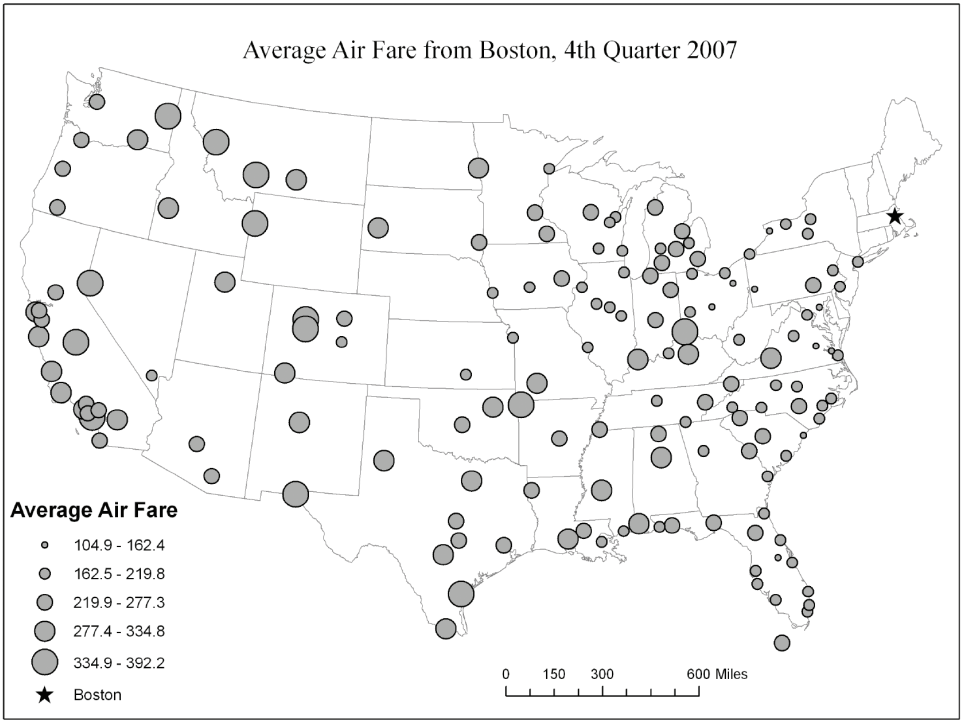

Figure 5. Distribution of average air fare for city-pair markets from Boston, 4th Quarter 2007.

Florida as a group have much lower fares, especially after considering the flight distance. This is largely due to the fact that most Florida cities are tourism destinations. Both passenger volume and competition are usually high. Another significant tourism destination enjoying low air fare is Las Vegas. The average air fare from Boston was only $218 for a 2381 mile flight. In a sharp contrast, Cincinnati, located only 752 miles away, had an average air fare of $339. The geographic variation in air fares, especially the "pockets of pain" phenomenon[5], can be further explained by factors such as competition and congestion.

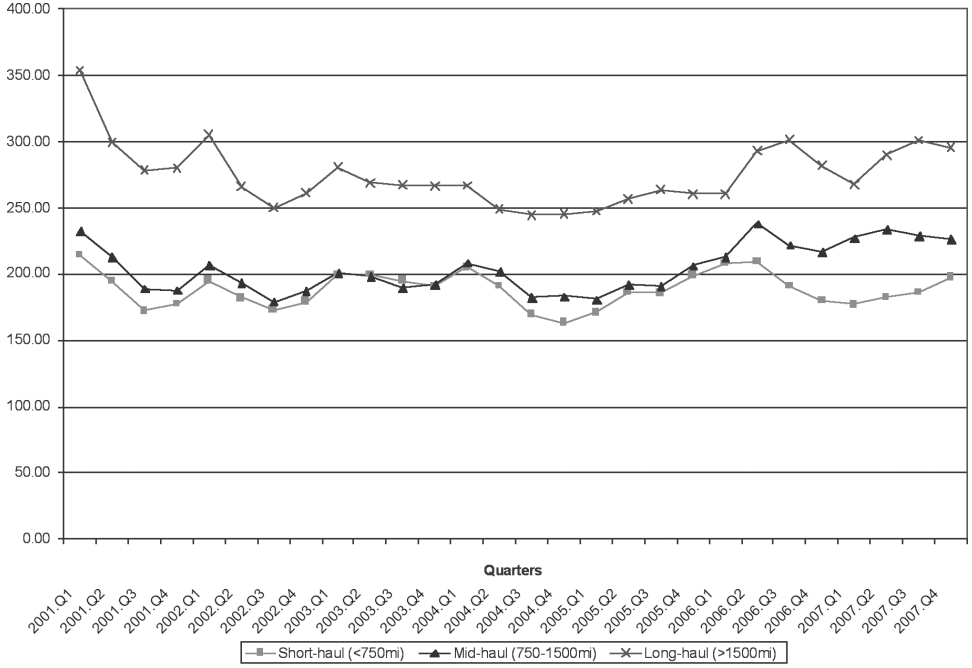

Figure 6. Average air fare for Short-haul, Mid-haul, and Long-haul city-pair markets from Boston, quarterly 2001-2007.

Figure 6 shows the quarterly variation of air fares from 2001 to 2007. For comparison, all the city-pair markets were first grouped into three categories based on flight distance: short-haul (flight distance less than 750 miles), mid-haul (flight distance between 750 and 1500 miles), and long-haul (flight distance greater than 1500 miles). An average air fare was then calculated for each market category. It is interesting to note from the chart that until the first quarter of 2006, the average fares on all three markets followed a quite similar pattern: fares were dropping before 9/11 attacks, and then remained largely stable in the following four years with minor ups and downs. The biggest change since 2006 was the divergence between short-haul and mid-haul markets: mid-haul trips became more expensive while the prices in short-haul markets dropped.

Competition

Competition has been at the core of airline deregulation. It was the promise of competition that prompted the decision to deregulate the airline industry, and whether competition could be sustained has become the key to safeguarding the achievement of deregulation (Gong 2006). Competition exists in multiple forms in the post-deregulation era. Airlines compete at airports, on individual city-pair markets, and in entire service networks. Dominance usually can give the incumbent carriers monopoly-like market power to influence prices and execute predatory practices.

Although several airlines have strongholds at Boston Logan Airport, Boston has never been the fortress hub city of any airlines. As a matter of fact, with more than twenty serving carriers, Boston Logan Airport is one of the most competitive airports in the nation. But even so, many city-pair markets from Boston are still dominated by one or two major airlines. One common measure of competition is airlines' market share. A city-pair market is considered as being dominated when a carrier has more than 50 percent market share.

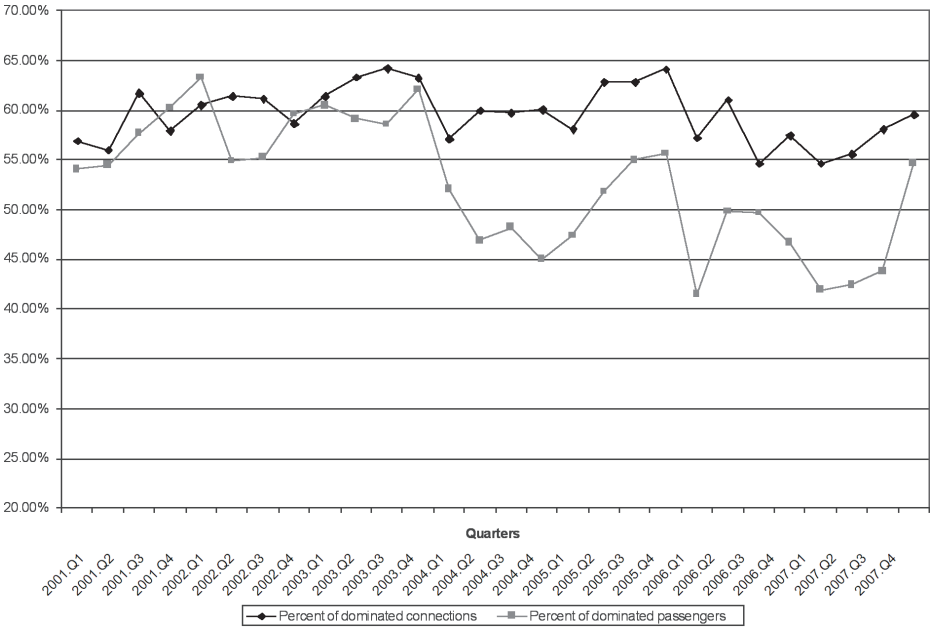

Figure 7. Competition at Boston airport measured by the percent of the city-pair markets dominated by one carrier and percent of passengers flying in dominated markets, quarterly 2001-2007.

Figure 7 presents the changing competition conditions at Boston Logan Airport from 2001 to 2007. Percent of dominated connections tells what portion of the city-pair markets were dominated by one carrier. Percent of dominated passengers measures the scale of passengers trav-

elling on dominated markets. The chart shows that the percent of dominated city-pair markets, while varying, fluctuated only between 55 to 65 percent over the study period. The percent of dominated passenger volume, on the other hand, has changed dramatically and fallen significantly below the level of city-pair markets since the first quarter of 2004. This indicates that since 2004 dominance has become more common among less densely travelled markets and/or competition has increased in markets with large traffic volume.

Airlines

Many airlines have or had provided services at Boston Logan Airport. During the study period 2001-2007, some airlines (such as Midway Airlines) ceased operation; some airlines (such as Trans World Airlines) were acquired and merged with other airlines; and some others (such

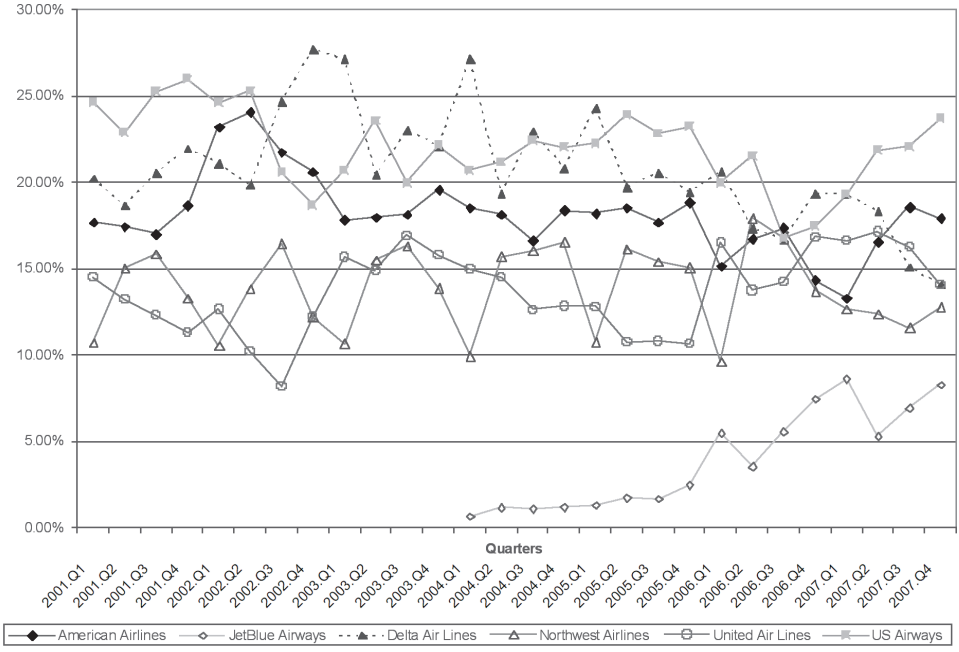

Figure 8. Market shares of major airlines at Boston airport, quarterly 2001-2007

as JetBlue Airways) just started. Among the many airlines serving Boston, most have a relatively small proportion of the total traffic; none of them have established dominant position.

Figure 8 shows the market shares of major airlines at Logan Airport. Two pieces of information can be extracted from this Figure. First, as a low-cost airline, JetBlue Airways has found its niche at Boston and grown steadily since its inauguration in 2004. Second, in general the differences between market shares of major airlines at Boston have become smaller over the past several years, indicating a trend of increasing competition among airlines.

Discussion and Conclusion

This study demonstrated that the Domestic Airline Fares Consumer Report can be a valuable data source for analyzing air travel activities. Its availability at quarter level (compared with annual statistics) makes it particularly useful in studying the seasonal variations in air travel. However, its aggregated form limits its usefulness for analysis at a finer level. For example, the report data cannot be used to study individual airline's behavior or performance in a particular city-pair market. To overcome this shortcoming, it is desirable to complement the report data with other data sources or research results.

As a major focus point for domestic air travel and an important international gateway, Boston suffered heavily from the 9/11 terrorist attacks. Total passenger enplanements dropped sharply. However, as the analysis of total connections indicated, this was not accompanied or caused by large scale service cuts from the airlines. In the aftermath of the terrorist attacks, the general public either reduced their travel activities or switched to automobile as an alternative, or both. Boston Logan Airport showed a slow yet steady recovery process. The passenger volume reached the pre-9/11 level in the second quarter of 2004 and has kept growing ever since.

There is a noticeable controversy in the existing literature regarding the long term impact of 9/11 on the air travel market. Some studies (Blake and Sinclair 2003; Gillen and Lall 2003; Ito and Lee 2005) suggested that 9/11 and its after-effects have had a long-lasting and widespread impact on airline and other related industries. Lai and Lu (2005) and Giglio (2002) on the other hand, found that the effect of 9/11 on air travel was only temporary. The case study of Boston in this paper seems to confirm the second view, but to draw further conclusions would require a comprehensive study of many other airports.

High passenger volume and relatively healthy competition have kept air travel at Boston fairly priced (Gong 2006). However, depending on the characteristics of the destinations, the costs of flying from Boston vary significantly. As widely observed in the deregulation markets, the traditional link between air fare and flight distance has become weaker. Although it still generally costs more to fly to the west coast, travel to destinations like San Diego and San Francisco are nevertheless expensive. In contrast, some cities in the Corn Belt and Rocky Mountain regions, due to lack of competition and/or other reasons, have become unreasonably expensive to access, forming the so-called "pockets of pain". On the other hand, famous tourist destinations are consistently enjoying lower than average air fares.

The existence of a good number of airlines and healthy level of competition are the key for a prospering air travel market. In spite of the destructive impacts of the 9/11 event, the air travel market at Boston remains active, maintaining high capacity passenger volume and attracting new carriers. It is pleasing to see that Boston is heading toward a healthy and strong air travel market in the post-9/11 years.

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Acknowledgments

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Notes

1. Author's calculation based on USDOT's Origin and Destination Survey: Data Bank 1A (2000).
2. All Domestic Airline Fares Consumer Reports can be downloaded free of charge from http://ostpxweb.dot.gov/aviation/x-50%20Role_files/consumerairfarereport.htm
3. See http://www.massport.com/logan/about.asp (last accessed 10 June 2009).
4. Source: Massachusetts Office of Travel and Tourism. http://www.bostonusa.com/partner/press/pr/statistics (last accessed 10 June 2009).
5. "Pockets of pain" refers to airports where average air fares are unusually high (Goetz and Sutton 1997).

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USING REMOTELY SENSED DATA AND GIS to Assess Development in Essex County, Massachusetts

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University of New Hampshire

ABSTRACT

Population and development of land in Essex County, Massachusetts have increased. As surrounding urban centers expand, proliferation into neighboring communities has become apparent. New residents create need for the development of land for housing, businesses, schools, ball-fields, and parks, and place significant strains on the existing land cover and available natural resources. To monitor development in the county, a change detection analysis was performed using remotely sensed data to determine the extent of land cover change over time. Change detection is a technique used in remote sensing to determine the changes in land cover or vegetation between two or more time periods. Change detection is an important process for monitoring and managing natural resources because it provides a means to quantify the areal extent and nature of the change. In this study, three change detection methods were applied to Landsat Thematic Mapper (TM) satellite data to detect land cover changes that occurred in Essex County, Massachusetts from 1990 to 2001: (1) Multi-date visual composite, (2) Image differencing and (3) Post-classification. The results from each change detection technique were compared to determine which method provided the most informative results. The post-classification method out-performed the multi-date visual composite and image differencing techniques as it provided the capability to qualitatively and quantitatively assess the type, nature, and extent of land cover change that occurred.
Keywords: change detection, land cover change, GIS, land development, remote sensing

Introduction

Since the 1970s, population and development of land in both Essex and Middlesex Counties in Massachusetts have increased, and as neighboring urban centers expand, both have proliferated into adjacent communities. This expansion has led to the conversion of land for housing, businesses, schools, recreation, and parks, placing significant strain on existing land cover and land use as well as available natural resources. In addition, mounting growth pressures and a reduction of undeveloped land have raised serious concerns as cropland and forest fragmentation, wetland destruction, protected open-space infringement, pollution, and systematic losses of rural conditions have become obvious. Without focused land cover and land use change research and community-wide environmental education, the continued loss of land may be accepted as "just" the results of progress.

Changes to the environment can provide insight into how land is or has been managed, and the use of established change detection research methodologies can serve to monitor these changes and evaluate management practices (Brothers and Fish 1978; Im et al. 2008). Change detection identifies the differences in the state of an object or phenomenon by observing it at different times and its methodology can provide the capability to: (1) detect occurrences of land cover change, (2) identify the types or nature of change, and (3) quantify its spatial extent (Brothers and Fish 1978; Singh 1989; Macleod and Congalton 1998). Change detection also can provide valuable insight into environmental and socio-economic conditions resulting from local, national, or international regulatory and/or land use policy changes over time (Lunetta and Elvidge 1998; Bontemps et al. 2008).

Traditionally, aerial photography had been utilized to detect changes in land cover in many areas (Richter 1969; Adeniyi 1980; Lo and Wu 1984). However, identifying land cover change through the use of aerial photography can be difficult because it requires a large data collection effort, time, manual interpretation (which can be subjective), and sophisticated mathematical computation to determine the distribution of the land cover type of specific interest (Weismiller et al. 1977; Lo and Shipman 1990). In addition, traditional or non-digital aerial photography cannot readily reveal the processes of land cover change without an extensive investigation or validation of the specific land cover classes of change within the field (Lo and Shipman 1990).

Beginning in 1972, the Landsat remote sensing satellite program has provided a more efficient and cost-effective method for monitoring land cover from space (Fung and LeDrew 1988; Lunetta and Elvidge 1998). Landsat has been utilized as an exclusive source of multi-spectral data for many studies because of its advantages over more traditional data capture methods like aerial photography (Gordon 1978; Martin 1989; DeFries and Chan 2000; Teillet et al. 2001). To detect changes in land cover, a comparison of two or more satellite images acquired at different times can be used to evaluate the temporal or spectral reflectance differences that have occurred between them (Masry et al. 1975; Yuan and Elvidge 1998). With its repetitive data acquisition (every 16 days), and seamless integration with advancing technologies such as geographic information systems (GIS), Landsat satellite data has made environmental monitoring applications such as change detection ubiquitous (Wickware and Howarth 1981; Rynzar and Wagner 2001; Thome 2001, Yuan et al. 2005; Wulder et al. 2008).

The primary objective of this research was to detect new development in Essex County, Massachusetts from 1990 to 2001. The specific objectives were to: (1) determine the appropriate methods to detect new development, (2) evaluate three change detection techniques and determine which provided the most informative results for Essex County, (3) quantify the nature and spatial extent of "from-to" land cover change that occurred, and (4) lay the groundwork for future land cover change research in Massachusetts.

Materials and Methods

Essex County is located in the northeast corner of the Commonwealth of Massachusetts. The county borders the Atlantic Ocean to its east, New Hampshire to its north, and Suffolk

and Middlesex counties to its south and west, respectively. The county comprises a land area of approximately 501 square miles (320,640 acres) and contains thirty-four municipalities, most of which are bucolic in character. Essex County also has five major interstate highways passing through it: Routes US-1, I-95, I-93, SR-128, and I-495, and contains three predominant urban centers: Lawrence, Lynn, and Peabody.

To ensure the accurate detection of land cover change and reduce the effects of seasonal phenological differences of vegetation, two near-anniversary Landsat TM images collected on 8 September 1990 and 29 August 2001 covering Essex County and the surrounding area were used.[1]

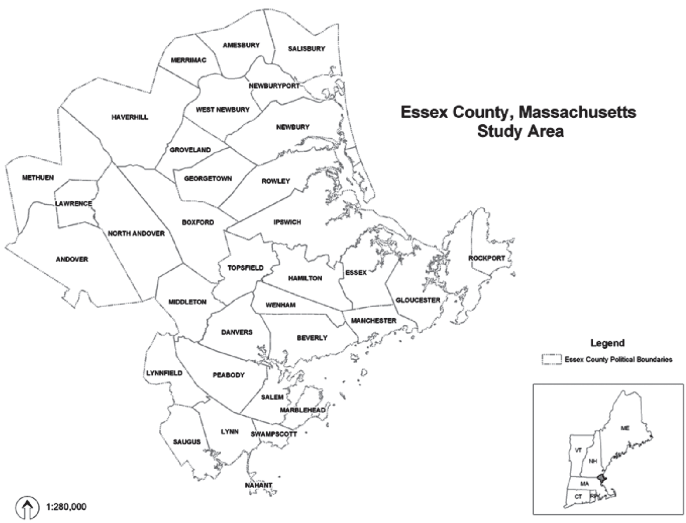

Figure 1. The study area of Essex County, Massachusetts is located in the northeast corner of the Commonwealth of Massachusetts in central coastal New England. The county comprises a land area of approximately 501 square miles and contains thirty-four cities or towns.

Reference data of Essex County were obtained from the: (1) Massachusetts Office of Geographic Information Systems (MassGIS); (2) Department of Natural Resources Conservation Resource Mapping Land Information Systems Laboratory at the University of Massachusetts (Amherst campus); (3) global positioning system (GPS) field assessments, and (4) aerial photography and imagery interpretations. These data consisted of primarily 1:12,000 scale CIR analog ortho-photographs produced in 1991, 0.5-meter resolution 1:5,000 scale color digital ortho-images produced in 2001, and scanned 1:24,000 scale USGS topographic quadrangles produced from 1982 to 1987. In addition, 1:5,000 scale GIS vector shapefiles produced from 1971 to 1999 comprising local, state, county, and township political boundaries were also

acquired and used for image masking and community landmark identification.

Reference data used exclusively for image classification accuracy assessment were acquired through field surveys using GPS and aerial photography/imagery interpretations. These data were consolidated and transformed into six GIS vector (point) shapefiles each containing fifty-one land cover class-specific reference data samples. Descriptive attributes embedded within these shapefiles (e.g., identification, land cover type, field position, etc.) were standardized using alphanumeric coding and condensed to form one conglomerate shapefile which housed all reference data samples (306 in total). All digital reference data utilized for comparison with the Landsat TM image classifications were projected into Massachusetts State Plane Coordinate System, North American Datum 1983 (NAD83) meters and were used in the ESRI ArcGIS version 9.0 geographic information system and ERDAS Imagine version 8.6 image processing platforms (ESRI 2004; ERDAS 2004).

Image Rectification, Masking, and Normalization

To prepare the satellite images for an accurate change detection comparison, it was imperative to geometrically rectify the imagery (Townshend et al. 1992; Kwarteng and Chavez 1998). Lunetta and Elvidge (1998) indicate that if any mis-registration greater than one pixel occurs, erroneous land cover change results will occur. Therefore, to lessen the impact of mis-registration on the change detection results, geometric registration was performed on a pixel-by-pixel basis using GPS-acquired ground control points. The accuracy of image registration is usually conveyed in terms of root-mean-square (RMS) error and for Landsat TM imagery, the acceptable RMS error is approximately 0.5 pixels (Townshend et al. 1992; Yuan and Elvidge 1998; Lunetta and Elvidge 1998). The research area was then extracted from each of the rectified images using the Essex County political boundary GIS shapefile (excluding offshore islands), and was re-projected into Massachusetts State Plane Coordinate System (NAD83) meters.

To improve the results of the change detection analyses and allow the differences of pixel brightness values between 1990 and 2001 imagery to be maintained as the actual changes in surface conditions (Mas 1999; Dobson et al. 1995; Yuan and Elvidge 1998), pixel reflectance values from clear and deep water bodies were assessed (Song et al. 2001; Gordon 1978). The spectral bands within each image were then extracted individually and evaluated, and the minimum digital number value (often attributed to the effects of the atmosphere) was subtracted from all of the pixels to shift the image histogram to the left so that zero values appear within the data (Chavez 1989; Jensen 1996; Pax-Lenney et al. 2001; Song et al. 2001). The spectral bands were then re-assembled into their appropriate origin and all histograms (adjusted and unadjusted) were reviewed to confirm the reliability of the corrections prior to performing the selected change detection analyses.

Data Exploration and Image Classification

Prior to image classification, a variety of false color composites were generated for each of the normalized images by loading the spectral bands in the imagery. These composites were used qualitatively to enhance the visual discrimination of land cover class types using the specific responsiveness characteristics of each spectral band. In addition, spectral pattern analyses and bi-spectral plots were developed and spectral/spatial enhancement filters (e.g., texture and smoothing filters) were incorporated to qualitatively distinguish land cover types and to assist with image classification.

To perform the post-classification change detection technique, classification of the 1990 and 2001 images was required. In addition, the development of a classification scheme was essential in order to organize and characterize the spatial information contained within the imagery into logical map categories for the change detection analyses (Congalton and Green 1999). The National Ocean Service's C-CAP Coastal Land-Cover Classification System (Dobson et al. 1995) served as the primary reference guide to develop seven distinct class categories: (1) Developed, (2) Bareland, (3) Forest, (4) Grassland, (5) Water, (6) Wetland, and (7) Unclassified.

The 1990 and 2001 images were classified independently using the unsupervised ISODATA (Iterative Self-Organizing Data Analysis Technique) algorithm (ERDAS 2004), to produce an output layer and signature to identify the spectrally unique clusters contained within the imagery. The pixels represented by these clusters were layered upon the rectified and normalized imagery for labeling. Clusters which could not be readily classified were subjected to an iterative "cluster-busting" algorithm technique for further ISODATA processing to identify additional clusters (Jensen et al. 1993). This procedure was iterated to achieve the desired level of classification for each image.

Upon completion, the final clusters were recompiled, mosaicked, and recoded into the appropriate categories of the classification scheme and smoothed using a 3x3 majority filter to remove or reduce speckling. An independent and quantitative accuracy assessment was then performed on the resulting 1990 and 2001 image classifications using the reference data and individual 6-class single date error matrices (Congalton 1988). In consideration of possible GPS positional errors often introduced during the field data acquisition process (e.g., from GPS unit limitations, satellite constellation configuration, atmospheric or ground surface disturbances, or forest canopy obstructions), 3x3, 6x6, and 9x9 window majority sizes (using a variety of clear majority thresholds) were tested in order to determine class value. Accuracy assessment measures (error matrix, class accuracy totals, and Kappa statistics) were generated for the 1990 and 2001 image classifications, and a Visual Basic program, KAPPA (Congalton 2004), was used to test and confirm the accuracy assessment statistics.

Change Detection

Three change detection techniques: multi-date visual composite, image differencing, and post-classification were selected and compared in this study. In addition, reduction in vegetation

was viewed as an indicator of development. Therefore, the multi-date visual composite image change detection technique was performed by inserting band 4 (Landsat TM near infrared) of the 2001 image into the green image plane and band 4 of the 1990 image into the red and blue image planes of the specific write function memory banks (e.g., red, green, and blue portions) of the computer monitor. The images were then overlaid to produce a visual composite to highlight the changes (growth and reduction) in vegetation and therefore development using additive color theory (i.e., the mixing of equal intensities of primary colors to make secondary colors) (Jensen 1996).

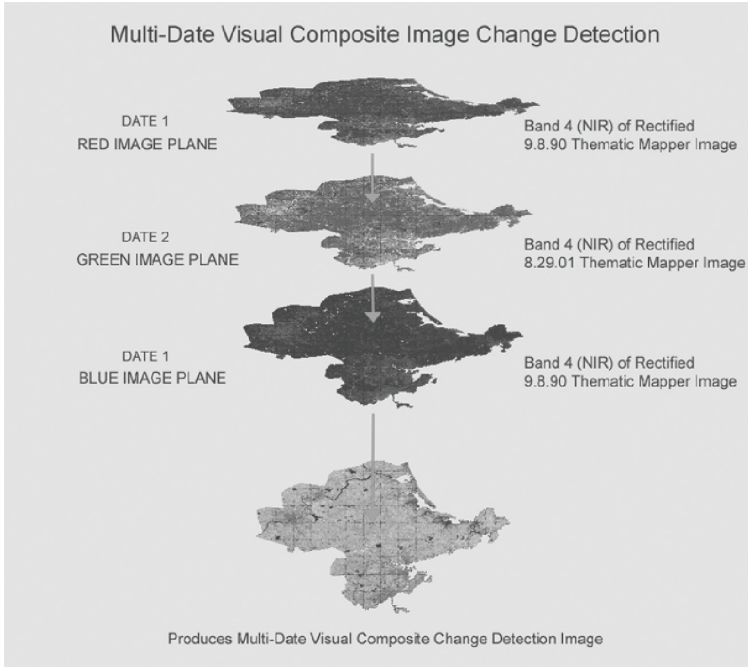

Figure 2. Procedural steps in performance of the Multi-Date Visual Composite Image Change Detection technique.

Image differencing was performed by subtracting the normalized digital number (DN) value of band 4 (Landsat TM near infrared) within the 1990 image from the DN value of the same pixel and band within the 2001 image. Standard deviation thresholds were then tested to separate these pixels within the image mask into the appropriate changed and unchanged categories to reflect the areas where "likely" or "realistic" change took place (e.g., where vegetation had been cleared to form new development).

In the post-classification technique, the 1990 and 2001 images were classified independently following the procedures outlined in the data exploration and image classification section and then compared within ERDAS Imagine and combined using the GIS MATRIX technique.

The matrix change image classification was then compared within ArcGIS with the reference data and image results from the previous techniques. A GIS analysis was conducted to refine the change image classification and "select-out" the areas where the land cover changed to form

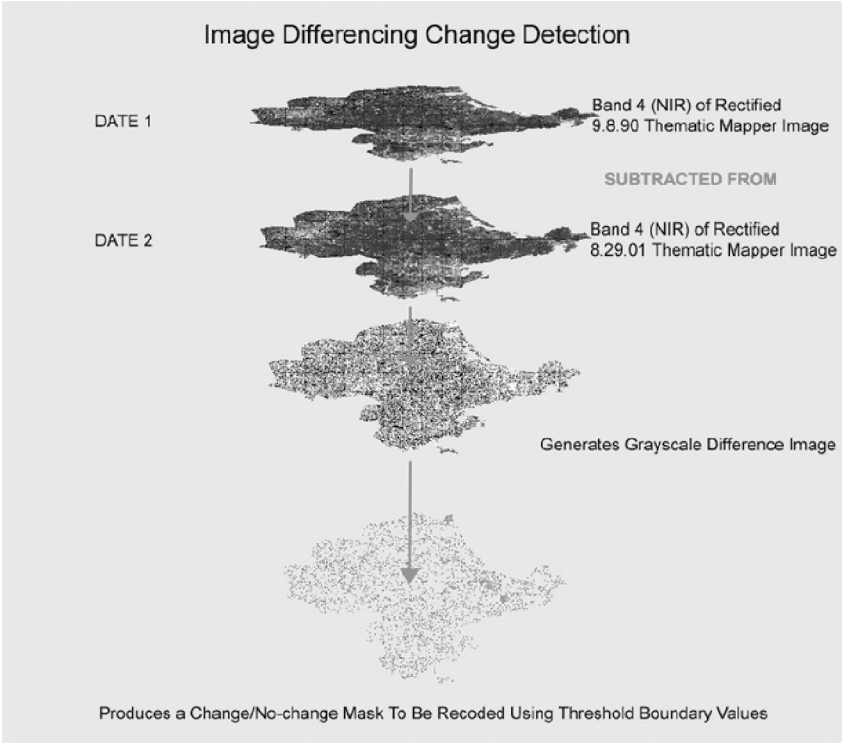

Figure 3. Procedural steps in performance of the Image Differencing Change Detection technique.

newly developed land. These areas were then assigned a distinctive thematic color value to differentiate the "from-to" or type and nature of land cover change which took place, and the corresponding pixel count information for each land cover class was then converted into ground area measurement units (or 0.162 acres which is the land area value of one 28.0-meter Landsat TM pixel), to quantify its areal extent. To determine how effective each method was in detecting change, the results from the image differencing and post-classification methods were qualitatively assessed using the reference data. In addition, the results of each change detection method were assessed for its capability to provide descriptive information on the land cover change that occurred.

Change Detection Technique Comparison

To provide a meaningful assessment of the agreement or disagreement present within the results generated from both the image differencing and post-classification techniques, a quantitative analysis was performed using the statistical analysis software package, SAS-Version 8.0 (SAS Institute, Inc. 2005). The pixel area results of the image differencing and post-classification techniques were recoded separately into three distinct values or groupings: 0 = background, 1 = no change, 2 = change, and were exported into ASCII format. Each image was then imported independently into SAS and the background was removed from each of the image data sets and a cross tabulation of the coded values (1 = no change, 2 = change) was then performed using the PROC FREQ option for statistical analysis.

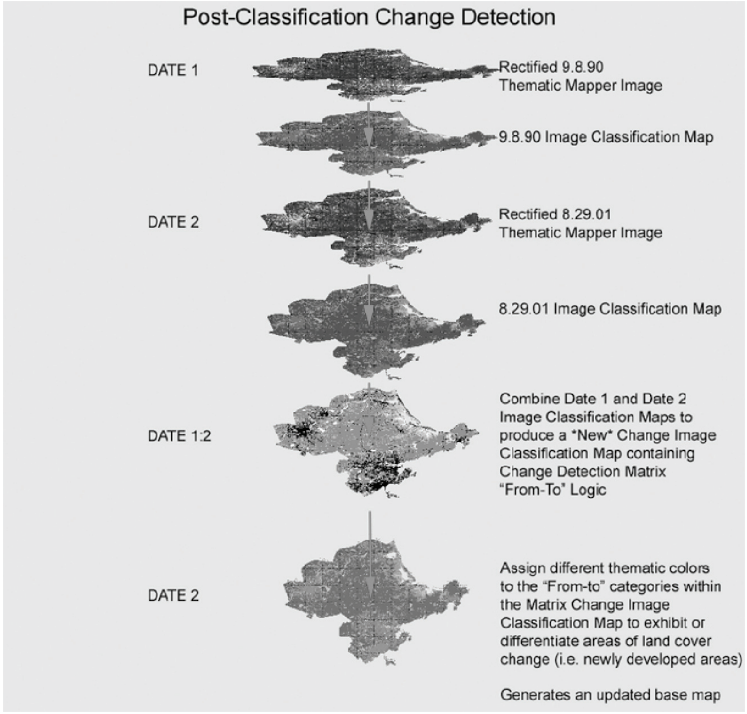

Figure 4. Procedural steps in performance of the Post-Classification Change Detection technique.

The 1990 image exhibited a north-westerly ground coordinate position shift of 1,026.25 meters from the 2001 image. A geometric correction was performed using ninety-three ground control points (GCPs) to register the 1990 image to the 2001 image with a first order polynomial transformation and nearest neighbor re-sampling algorithm. Geometric registration of

1990 Image Classification

		REFERENCE DATA						
		D	B	F	G	W	WT	Row Total
CLASSIFIED DATA	D	**50**	12	0	0	2	0	64
	B	1	**27**	0	2	0	0	30
	F	0	7	**51**	2	0	35	95
	G	0	3	0	**47**	0	9	59
	W	0	2	0	0	**49**	2	53
	WT	0	0	0	0	0	**5**	5
	Col. Total	51	51	51	51	51	51	**229**

PRODUCER'S ACCURACY			USER'S ACCURACY		
Developed (D)	= 50/51	98.0%	Developed (D)	= 50/64	78.1%
Bareland (B)	= 27/51	52.9%	Bareland (B)	= 27/30	90.0%
Forest (F)	= 51/51	100.0%	Forest (F)	= 51/95	53.7%
Grassland (G)	= 47/51	92.2%	Grassland (G)	= 47/59	79.7%
Water (W)	= 49/51	96.1%	Water (W)	= 49/53	92.5%
Wetland (WT)	= 05/51	9.8%	Wetland (WT)	= 05/51	100.0%

OVERALL ACCURACY		KAPPA ANALYSIS RESULTS		
		KHAT	Variance	Z Statistic
= 299/306	74.8%	0.698	0.0008259	24.288858

Table 1. Accuracy assessment of the 1990 image classification.

the 1990 image to the 2001 image resulted in an overall root-mean-square (RMS) error of 11.8 meters, which was well within the documented acceptable limits (Lunetta and Elvidge 1998).

A noticeable upward shift in the pixel values from 1990 to 2001 was present within the visible bands (Landsat TM bands 1-3), likely a result of effects of atmospheric conditions at the time of satellite acquisition (Jensen 1996). In addition, the National Oceanic and Atmospheric Administration (NOAA) recorded differences in the temperature and precipitation values (in several climate monitoring stations county-wide) for each image acquisition date. Therefore, the high minimum values were subtracted with the appropriate bias values to adjust and shift the affected histograms in each image to the left to within one positive brightness value of a zero reflectance value, thus ensuring the 1990 and 2001 satellite data were valid for comparison.

The "cluster-busting" classification technique (Jensen 1996) produced 271 clusters for the 1990 image and 284 clusters for the 2001 image. For the accuracy assessment, the results produced for the 3x3, 6x6, and 9x9 window majority sizes and thresholds were similar for all sizes of clusters. Therefore, the 6x6 window majority size with a 36 out of 36 clear majority threshold rule was selected and used for the assessment. Tables 1 and 2 display the assessment results from the error matrices derived for each image classification. The overall accuracy achieved for the

2001 Image Classification

		REFERENCE DATA						
		D	B	F	G	W	WT	Row Total
CLASSIFIED DATA	D	**51**	10	0	0	2	0	63
	B	0	**38**	0	0	0	0	38
	F	0	1	**51**	2	0	20	74
	G	0	2	0	**49**	0	3	54
	W	0	0	0	0	**49**	2	51
	WT	0	0	0	0	0	**26**	26
	Col. Total	51	51	51	51	51	51	**264**

PRODUCER'S ACCURACY			USER'S ACCURACY		
Developed (D)	= 51/51	100.0%	Developed (D)	= 51/63	81.0%
Bareland (B)	= 38/51	74.5%	Bareland (B)	= 38/38	100.0%
Forest (F)	= 51/51	100.0%	Forest (F)	= 51/74	68.9%
Grassland (G)	= 49/51	96.1%	Grassland (G)	= 49/54	90.7%
Water (W)	= 49/51	96.1%	Water (W)	= 49/51	96.1%
Wetland (WT)	= 26/51	51.0%	Wetland (WT)	= 26/26	100.0%

OVERALL ACCURACY		KAPPA ANALYSIS RESULTS		
		KHAT	Variance	Z Statistic
= 264/306	86.3%	0.831	0.0005469	35.752

Table 2. Accuracy assessment of the 2001 image classification.

1990 classification was 74.8% with a KHAT value of 0.698, and the overall accuracy for the 2001 classification was 86.3% with a KHAT value of 0.831.

Change Detection - Multi-date Visual Composite

The multi-date visual composite image change detection technique performed using the 1990 and 2001 images resulted in the generation of a new "virtual" composite. Figure 5 illustrates these results in a larger scale image subset comprising the Merrimack Valley portion of the county. An interpretation (of Figure 5) suggests that the magenta regions (or dark grayscale areas if in b/w) within the image composite represent vegetation which has been cleared for new urban development. The green regions (or lighter gray areas) represent higher response in the near infrared wavelength due to the re-growth of vegetation, and the mid-range gray regions represent areas where no change in land cover occurred.

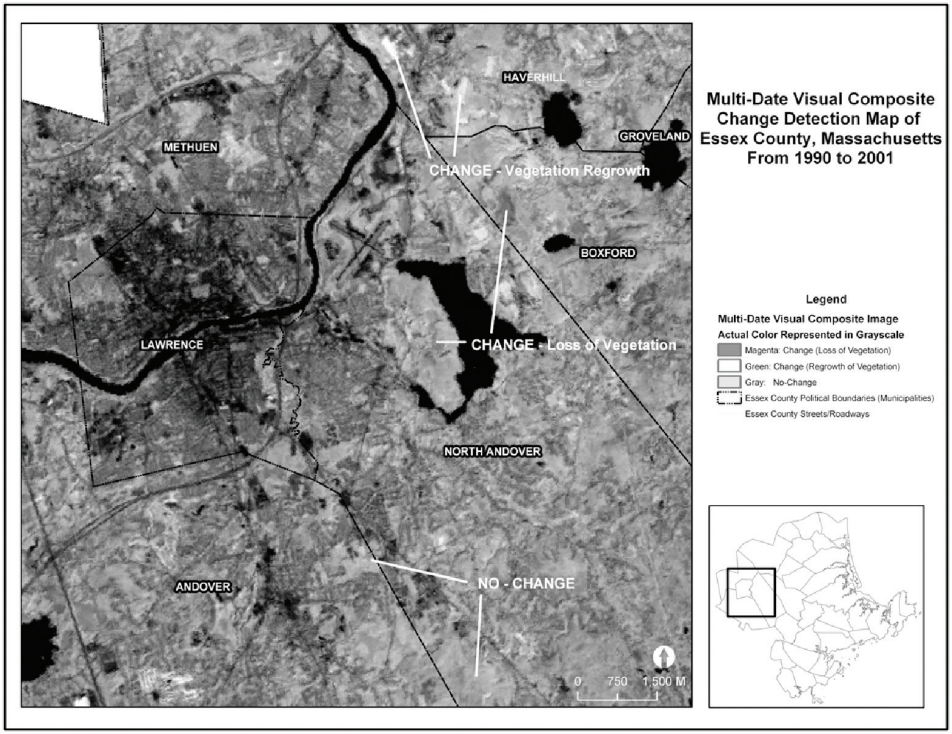

Figure 5. Multi-date visual composite change detection map of Essex County. The magenta regions (or dark grayscale areas if in b/w) within the image composite represent vegetation which has been cleared for new urban development. The green regions (or lighter gray areas) represent higher response in the near infrared wavelength due to the re-growth of vegetation, and the mid-range gray regions represent areas where no change in land cover occurred.

Change Detection - Image Differencing

The image differencing change detection technique produced a grayscale difference image which reflected the changes or differences in the individual pixel values between the two image dates. A comparative assessment of the histogram values within the change/no-change mask and multi-date visual composite image revealed that the pixels which did not change in brightness value between the two image dates were distributed around the mean, and the pixels that changed between the two image dates were found within the tails of the histogram (Khorram et al. 1999). Therefore, twelve standard deviation thresholds were tested in order to separate these pixels within the mask into the appropriate changed and unchanged categories to reflect the areas where "likely" or "realistic" change took place within the county (e.g., where vegetation had been cleared to form new development). At the lowest threshold level (1.0) too many pixels

were classified as changed. As the threshold level increased, a reduction in amount of change pixels displayed occurred, and at the highest threshold level (6.0) there were not enough pixels classified as 'changed'.

The best threshold boundary for use in the change detection analysis technique maximizes the appropriate amount of changed pixels displayed by reducing or removing those pixels which are the products of slight pixel-radiance change introduced from active land cover changes (at various phenological stages), geometric alignment errors, radiometric normalization errors, and/or surface moisture differences. Therefore, after several iterations, using the field reference data and multi-date visual composite change image for a comparative assessment, the (3.0) standard deviation from the mean was found to be the most suitable threshold boundary to achieve the desired extraction result (i.e., separation of changed from unchanged pixels).

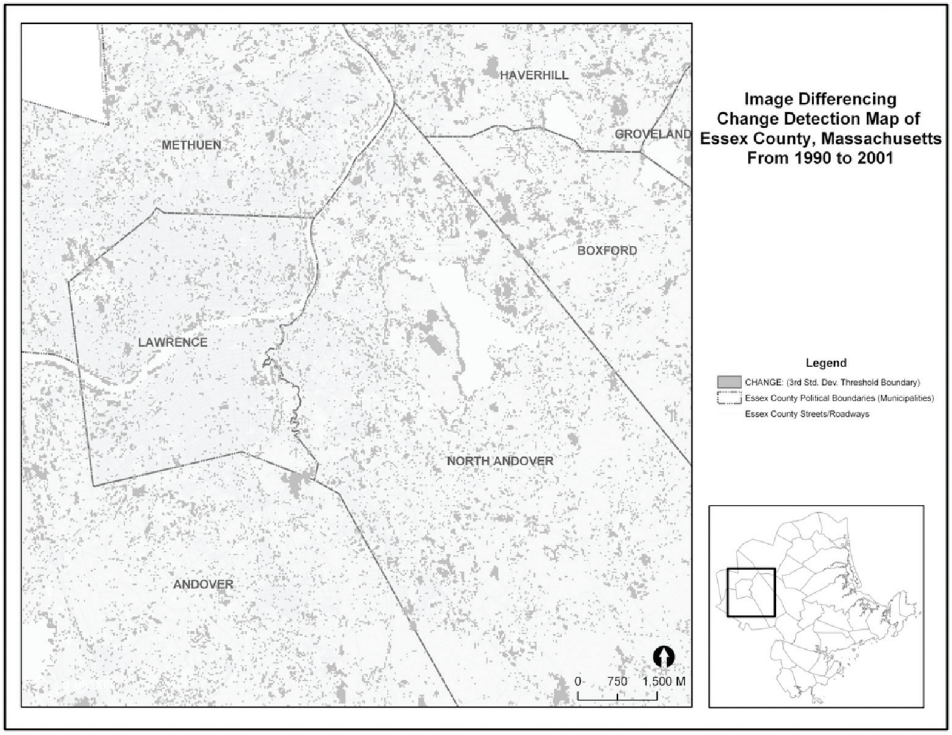

Figure 6. Image Differencing change detection map of Essex County. The grayscale difference image reflects the changes or differences in the individual pixel values between the two image dates. This image was derived by testing several standard deviation thresholds to separate these pixels within the image into the appropriate changed and unchanged categories to reflect the areas where "likely" or "realistic" land cover change took place within the county.

Change Detection - Post Classification

The GIS MATRIX procedure produced a grayscale matrix change image classification (raster) with an associated database attribute table depicting the land cover class changes that occurred between the 1990 and 2001 image classifications using thirty-six "from-to" land cover class identifier categories with corresponding classified pixel counts. This study's primary focus was to detect and quantify areas within Essex County that changed to form new development. Therefore, as can be seen in Figure 7, the appropriate "from-to" class identifier categories and/or pixel regions within the matrix change image classification (i.e., from Bareland to Developed, From Forest to Developed, From Grassland to Developed, etc.), were selected.

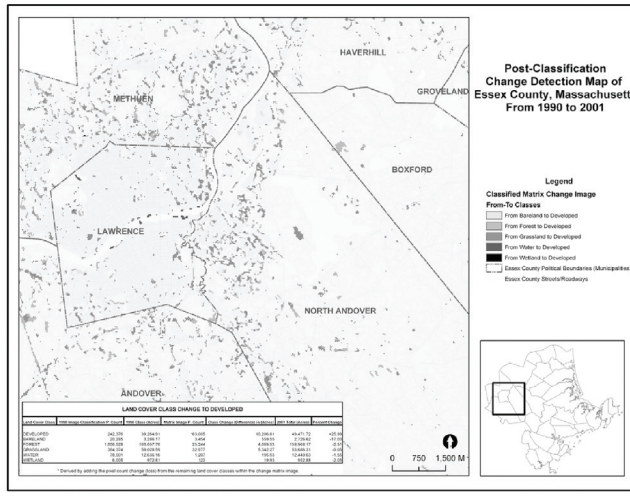

Figure 7. The post-classification change detection map of Essex County. This technique provided the capability to illustrate the land cover class changes that occurred between the 1990 and 2001 image classifications (as shown here in grayscale format) in thirty-six "from-to" land cover class identifier categories with corresponding classified pixel counts. The "from-to" class identifier categories and/or pixel regions (e.g., from Bareland to Developed, from Forest to Developed, from Grassland to Developed, etc.) within the matrix change image classification were originally assigned thematic colors (shown here in grayscale format) to highlight land cover change to developed land.

Essex County gained approximately 10,200 "new" acres of development from 1990 to 2001 through a combined loss in acreage from the Bareland, Forest, Grassland, Water, and Wetland land cover class categories. This indicates that there was an approximate 26.0% overall increase in newly developed land areas within the 1990 and 2001 image classifications from approximately 39,000 to 49,000 acres or 60.93 to 76.56 square miles.

The resulting matrix (Figure 8) shows the pixel count and percentage agreement between the post-classification and the image differencing technique.

The two techniques agreed with each other in the detection of change and no change 77.3%

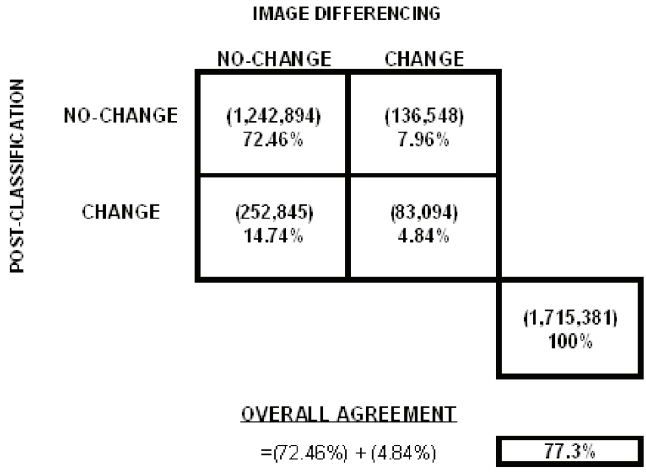

Figure 8. Percentage agreement matrix for the image differencing and post-classification change detection techniques.

of the time. For approximately 15.0% of the pixels, the post-classification technique detected a change while image differencing did not. Conversely, for approximately 8.0% of the pixels, image differencing detected a change while post-classification did not. Therefore, in all, the two techniques were in disagreement for 23.0% of the pixels.

Discussion and Conclusions

The multi-date visual composite image change detection technique proved to be efficient to produce a rapid "on-screen" visualization of the changes in both vegetation and development that occurred within the county. As the results from this technique are generated and stored within the computer workstation's virtual memory, statistical image classification is not feasible. Therefore, the unique spectral clusters contained within the composite of satellite data of Essex County could not be effectively labeled or classified with the distinct land cover class information required to perform further, more robust, land cover change analyses.[2]Although this technique was unable to provide a quantitative assessment through the use of classified "from-to" land cover change identifiers, the resulting image composite was useful to qualitatively assess and explore the overall amount and location of land cover change which took place within the county from 1990 to 2001. Furthermore, the results derived from this technique proved to be a valuable asset as they were used extensively within the GIS to: (1) test and develop the optimum threshold boundary to separate the change/no-change pixels within the change/no-change mask produced by the image differencing technique, (2) interpret the results from the post-

classification technique, and (3) compare and contrast the correspondence of the change pixels derived from each of the selected change detection techniques. Therefore, this technique was effective in providing the capability to rapidly look at the changes that occurred in Essex County using two dates of remotely sensed imagery at one time.

Image differencing, like the multi-date visual composite technique, also provided an efficient means to illustrate the individual pixels within the imagery that have changed between the two time periods. The results generated from this technique simply identified the areas that may have changed or were in the process of change, and did not provide definitive information on the nature of the change (i.e. from-to information) which occurred within the county within the given study period (Jensen 1996). However, image differencing is extremely valuable when used in combination with other change detection techniques (Khorram et al. 1999). The results from the image differencing technique indicate a 15.37% (47,469.62 acres or 74.17 square miles) overall change in land cover took place within the county from 1990 to 2001. As compared to the post-classification's 19.58% (62,484.65 acres or 97.63 square miles) change results, clearly, the success of this technique relies heavily upon the highly subjective and empirical testing and placement of pixel value thresholds to discriminate and extract the changed from unchanged pixels from within the change/no-change mask. Furthermore, additional data exploration and more extensive field research may prove useful in the development of "optimum" or appropriate threshold boundaries to more accurately depict the land cover changes that took place.

Though the operation of image differencing is straightforward, careful consideration of its limitations or sensitivities also must be taken. The results from this technique can often be misinterpreted, because some of the pixels reflecting change between the two time periods can be the products of slight, subtle, or variable pixel value changes caused by image rectification or radiometric correction (normalization) differences, and/or environmental moisture conditions. These effects can increase the difficulty of distinguishing areas where land cover classes definitively changed. Therefore, a strong understanding of the sources of errors which can be introduced to the remotely sensed data, coupled with the procedures to correct or reduce their effects prior to performing the analysis, can greatly enhance or improve the overall reliability of the results of this (and other) change detection techniques.

Prior to performing the post-classification technique, a good overall agreement was found between the interpretations of the reference data and the land cover classifications for the image data sets used. The accuracy measures (producer's, user's, Kappa, and Z significance statistics) calculated in the error matrices imply that the classification of the Landsat TM data were appropriate for the purposes of the study, and they justified the use of the derived image classifications for this technique. This technique supplied the most informative results of the three change detection techniques performed, as it provided the capability for both qualitative and quantitative assessment of the land cover changes that occurred to form new developed areas within Essex County from 1990 to 2001.

The combined image classifications allowed for the production of a change image classification from which matrix logic could be used to thematically represent and highlight the "from-to" land cover class changes that took place. In addition, this technique provides valuable change/no-change pixel count information which could be stored within a GIS and converted

to the actual ground area to assess the overall gain or loss of a particular land cover class of interest within a given area. However, the results of this technique are directly influenced by the image classifications produced prior. As can be seen from the differences reported in the overall land cover percentage change results, careful consideration of the procedural complexities of image classification and a quantitative accuracy assessment of the change detection results are recommended.

The comparison of results from the image differencing and post-classification change detection analyses provided the capability to explore and gather further insight into the land cover changes using the specific capabilities of more than one technique at one time. After an extensive evaluation of the results from the quantitative analyses, the majority of the disagreements were found to be in pixel regions where the land cover was in the process of change or where the land cover did not change, but differences in moisture content were likely present (e.g., grasslands). In addition, slight pixel reflectance value changes were detected and may have been introduced during the data preprocessing phase from errors in geometric registration, radiometric normalization, and/or image classification errors.

However, the overall percentage of land cover change statistics generated by the image differencing and post-classification techniques (image differencing 15.37% and post-classification 19.58%), indicate that these techniques produced similar results and that the actual amount of change may fall somewhere between these two values, given the constraints of the image data sets used and the image processing methodologies employed within this study. Furthermore, this comparison can provide an image analyst with a powerful diagnostic tool to explore and evaluate the results of numerous change detection analysis techniques, gain further insight into the nature of land cover changes (e.g., stages of surface changes or disturbances) which can occur within a given region at a given time, and/or expose image data processing errors which can reappear as inaccurate change detection analysis results.

This study compared three change-detection techniques to detect new development using Landsat TM imagery. Assessing land cover change through the use of remotely sensed data can often be challenging and the results uncertain. Extensive processing of the satellite imagery is required in order to produce accurate change detection results. Performing this change-detection analysis allowed for the monitoring of a landscape over time and has shown that the integrated use of satellite remote sensing and geographic information systems (GIS) technology is suitable for the detection and quantification of the nature and extent of land cover change of newly developed areas within Essex County from 1990 to 2001. This research also lays the foundation for further research to be conducted in a variety of disciplines within this region, and the methods employed here may serve as a valuable reference guide for land managers to not only provide a basic awareness of the capabilities of the readily available technology to perform land change analyses, but also foster learning about the environment, and assist in advancing sound and sustainable land-use practices.

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Notes

1. Two near-anniversary Landsat TM images were collected on 8 September 1990 (Landsat 5: ID# 5012030009025110) and 29 August 2001 (Landsat 7 ETM+: ID# 7012030000124150), covering Essex County and the surrounding area (WRS 12/30).

2. For instance, using TM bands(B,G,R, NIR or 1,2,3,4) an image analyst can select and place TM band 4 into the (RGB) color guns of the computer monitor display to compare vegetation and/or water differences between the two time periods. This technique only provides a virtual "layering" of image data within an image viewer within ERDAS Imagine. This technique does not generate or store statistical attributes (or brightness value data behind the raster pixels in tabular format), and therefore, image classification algorithms cannot be performed. Its results are only "visual". These data can be exported in "image" format but not analyzed statistically.

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GEOMORPHOLOGICAL IMPACTS of Channel Straightening in an Agricultural Watershed, Southwestern Québec

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ABSTRACT

River straightening was widely used in the 20th century to drain fields more rapidly in the spring and increase food productivity in agricultural watersheds. Although straightening has now ceased, dredging remains the leading strategy utilised in southwestern Québec to counter straightened channels' natural re-meandering processes. This research assesses the geomorphological impacts of dredging straightened agricultural rivers and evaluates alternative solutions addressing bank erosion issues. The case study of the Richer Stream, an extensively altered agricultural river encompassing two sharp bends in a reach flowing between a residential area and an agricultural field is examined. GIS analysis of the channel planform allowed the identification of geometrical changes that occurred between 1932 and 2006 and revealed a decrease of 2.2 km in the entire stream length and of 347 m in the residential reach, resulting in slope increases of 32 and 63 percent at the watershed and residential reach scale, respectively. High-resolution topographic data were acquired in the residential reach to capture channel dimensions and shapes six years after it was last dredged. Evidences of river adjustment towards a sinuous planform include a widening of the channel through bank particle erosion and mass failure mechanisms, channel aggradation, and a 6-percent increase in sinuosity. A marked increase of bed shear stress and stream power values in bends suggests their high instability; dredging is unsustainable in this context. The proposed alternative solutions include improved management strategies such as enlarging riparian vegetated strips or letting meanders redevelop, hydraulic structures, bioengineering techniques and channel alteration.

Keywords: bank stabilization, bioengineering, channelization, erosion control, hydraulic structure, river straightening

Introduction

During the last century, many streams in agricultural landscapes of Europe and in North America were straightened to drain fields more rapidly in the spring, resulting in increased food productivity and facilitated crop maintenance following the removal of meander belts (Hupp 1992; Rhoads and Herricks 1996; Scheumann and Freisem 2002; Simon and Rinaldi 2006; Beaulieu 2007). Straightening thus benefited rural income, and reduced the frequency

and magnitude of overbank flow events for individuals and infrastructure (Hupp 1992). In the St. Lawrence Lowlands in Québec, channel straightening and widening were supported and encouraged by governmental authorities from 1917 to 1986 (Ministry of Agriculture, Food and Fisheries of Québec [MAFFQ] 2001). It is estimated that 30,000 km of meandering rivers were straightened in the St. Lawrence Valley between 1944 and 1976, and an additional 14,000 km of straight channels were created, draining approximately 1.5 million hectares of land (Boutin et al. 2003; Beaulieu 2007). Since then, dredging was used on a regular basis to re-establish the modified channel dimensions (Beaulieu 2007).

From both ecological and geomorphological perspectives, many of the straightening projects are unsustainable (Brookes and Sear 1996; Frothingham et al. 2002). However, there is a general paucity of available information about past restoration projects (Bernhardt et al. 2005; Brooks and Lake 2007). Overall, few studies suggest that these interventions are successful in achieving channel stability or habitat enhancement objectives (Thompson and Stull 2002; Shields et al. 2003; Thompson 2006). Here, a case study from the Richer Stream, located in southwestern Québec, is used to: 1) assess the impacts of channel straightening and dredging in an agricultural stream, and 2) determine which river management options would provide the most sustainable alternative at two scales: the watershed scale, and the stream reach scale in a residential sector which is particularly prone to bank erosion.

Background

Meandering rivers represent a stable channel pattern on shallow slopes with fine grain size and limited sediment supply (Church 1992), as is the case in the St. Lawrence Lowlands. The straightening of a meandering channel results in the simplification and homogenization of cross-sectional geometries and dimensions, stream planform, substrate type and flow patterns, and in the smoothing of bed topography (Brookes and Sear 1996; Frothingham et al. 2002). Straightened channels typically experience bed incision and river widening due to reduced bed friction, increased slope, increased velocity and stream power and associated bank failures (Hupp 1992; Frothingham et al. 2002; Lau et al. 2006; Simon and Rinaldi 2006). The elimination of floodplain storage and the increased hydraulic efficiency in straightened channels also generate increases in discharge, which may cause downstream flooding (Brookes 1988; Lau et al. 2006). Furthermore, dredging destroys bed armouring and gravel streambed internal structure, contributing to particle entrainment and channel instability (Wyzga 2001). Water and bio-physical quality are also affected by the increase in sediment transport capacity that follows the increase in drainage density and in maximum discharge peaks (Beaulieu 2007). In addition, the removal of streamside vegetation increases stream temperature and rarefies fish shelters (Frothingham et al. 2002). River management strategies in straightened streams typically imply a recurrent dredging procedure, although alternative solutions are increasingly being put forward to stabilize lowland agricultural streams or streams whose development is subject to space limitations (MAFFQ 2001; Piégay et al. 2005).

River management strategies that have been adopted to solve problems created by channel straightening range from restoration projects aiming at a complete recovery of former characteristics to the more recent concepts of river corridor, where the river is allowed to erode its banks, in a controlled "natural" state (Malavoi et al. 2002; Piégay et al. 2005). The incorporation of geomorphological principles into river engineering practices facilitates the establishment of sustainable long-term management strategies by understanding geomorphic processes at both the watershed and the reach scale (Rhoads and Herricks 1996; Kondolf et al. 2003). For example, several restoration projects of channelized rivers in Denmark which included some re-creation of meanders proved beneficial for macroinvertebrate density (Nielsen 1996). However, these projects require public support. In the case of agricultural streams, farmers may favor instead land drainage efficiency, as was the case in Illinois (Rhoads and Herricks 1996).

The implementation of management strategies may be supported by the installation of hydraulic structures, often referred to as hard engineering, or by the use of bioengineering techniques to enhance bank protection by increasing bank erosional resistance (Hey 1996; Kondolf et al. 2003). Hydraulic structures rely on the installation of in-stream physical components such as drop structures, energy dissipators, deflectors and bank revetments to alter river flow, or of revetments to improve bank protection. These structures were used widely during the recent decades to prevent or mitigate erosion problems, improve fish habitat quality, or both. However, there is still no agreement on their effectiveness, on the type of building materials and on the most appropriate design to use (Biron et al. 2004a). Furthermore, numerous cases of restoration failure have been documented following the implementation of instream structures (Downs and Kondolf 2002; Thompson and Stull 2002).

Bioengineering techniques to enhance river stability are recognized as soft-engineering methods because they do not change natural conditions such as the river planform, slope, and geomorphic units (Bennett et al. 2008). Instead, they assist the development of riparian vegetation that will eventually stabilize streambanks to a certain degree. For example, plant roots increase bank strength, preventing mass failure in lower reaches (Abernethy and Rutherfurd 1998; Millar 2000; Rey et al. 2004). In-stream vegetation decreases near-bank flow velocity and associated particle entrainment in mid-basin reaches by protecting soil particles against raindrops, trapping and retaining stream sediments, increasing infiltration rate, and decreasing erosion potential of runoff (Abernethy and Rutherfurd 1998; Millar 2000; Rey et al. 2004; Bennett et al. 2008). Wider riparian strips, i.e., the along-stream corridor adjacent to a river that is used to accomplish various natural functions, increase the overall catchment's response times to precipitation events and decrease peak discharges, and associated erosion rates (Anderson et al. 2006). The use of bioengineering to enhance bank stability is known to reduce the speed at which a bank erodes (Sudduth and Meyer 2006). More species are also observed in riparian habitats where trees are present (Boutin et al. 2003). Québec's provincial laws require at least 3 m of riparian vegetated strip in agricultural areas. This measure would be sufficient to capture fertilizers, pesticides and eroded soil particles, but insufficient for most plant and animal species requirements; plant species typically require a strip width of 10 to 30 m beyond high water mark whereas birds necessitate 75 to 175 m (Spackman and Hugues 1995; Boutin et al. 2003).

Methods

Study site

The Richer Stream is located in southwestern Québec near the municipality of Saint-Marc-sur-Richelieu, approximately 25 km east of Montréal (73.20°W, 45.68°N). This second order stream (using method of Strahler) is a tributary of the Richelieu River, which drains into the St. Lawrence River. The Richer watershed area is 17 km^2, with a main trunk of 6.9 km and 9 tributaries totaling 13.5 km in length. Two scales are considered in this study: the watershed scale (Figure 1a) and the reach scale which includes a section of the stream flowing between a residential area and an agricultural field (Figure 1b).

This Richer watershed is the subject of one of 10 pilot studies initiated in 2005 by the *Fondation de la Faune du Québec*[1] and *Union des Producteurs Agricoles du Québec*[2] on biodiversity and sustainability in agricultural streams. It represents a typical example of a southern Québec stream that was straightened to improve agricultural drainage, and where the riparian vegetated strip is very narrow. Due to the instability of the straight channel and the lack of bank protection, dredging must be performed on a regular basis in this stream to re-establish the channel's trapezoidal cross-sections and linear planform. Dredging is seen by many residents of the municipality and decision-makers as the main stream management strategy. Since the practice of straightening and dredging was widely used in North America in the twentieth century, this case study is representative of many agricultural watersheds.

Data collection

The data used in this study were collected from August to November 2007, approximately 6 years after the last dredging operation occurred. Measurements of the stream bed and bank topography for the residential reach were taken with a Leica total station model [TC805L] at a density of about 0.4/m^2 for a 350-m long reach. This section includes two non-natural sharp bends where bank erosion is known to be problematic (Figure 1b). In general, 4 points were acquired on the bed and 4 on each bank at cross-sections spread apart by 3 to 5 m. Intermediate points were also taken to capture irregularities in the channel bed and banks. Samples of bed and bank sediments were collected at 4 cross-sections along that reach (Figure 1b). The laboratory analysis revealed that all samples consisted of fine silt and clay. As no gauging station is available for the Richer Stream, a staff gage was installed at a cross-section upstream of the residential sector to obtain daily water level measurements over a period of 41 days, which were then used to estimate parameters such as discharge, velocity, shear stress and stream power.

Some GIS data were already available at the onset of the project as the local agro-environmental organization, *Club Consersol Vert Cher*, agreed to share their GIS database with us. This database comprises topographic points, geo-referenced aerial photographs dating from 1932, 1964, 2000, 2004 and 2006, and land use, vegetation cover, water runoff and land erosion maps. The dataset include detailed metadata. Legal documentation concerning the stream dating from 1943 to 2006 was also provided by the regional municipality of county of *La Vallée-du-Richelieu*. Personal communications with local residents also helped in understanding and quantifying some of the historical aspects of the Richer Stream evolution.

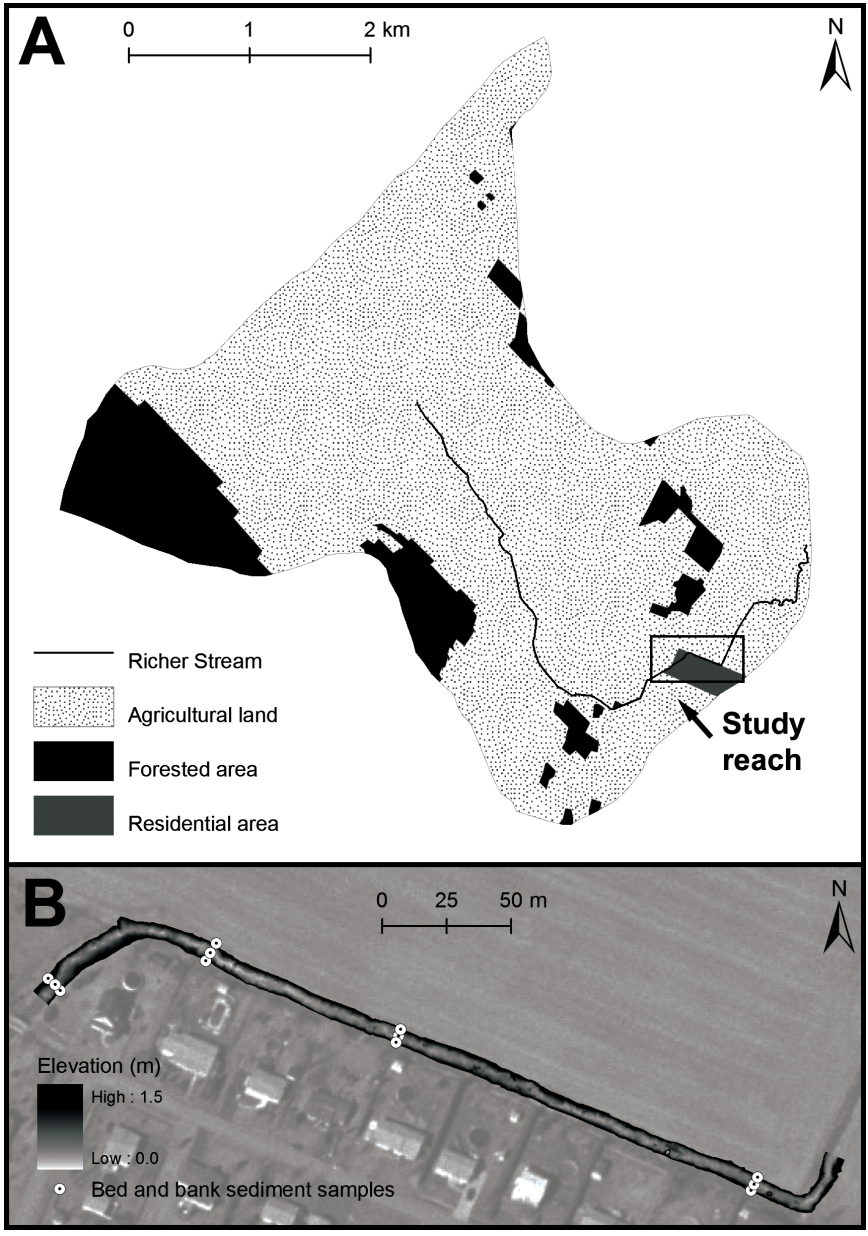

Figure 1. a) Richer watershed including the study reach near residential area. b) DEM of the residential area showing the four cross-sections where sediments were sampled. Flow is from left to right.

Data processing

Two digital elevation models (DEMs) were generated for this study: one for the residential reach and another for the entire watershed. The residential reach DEM was interpolated from the total station measurements using the Natural Neighbours method in the GIS software (ArcGIS version 9.2). This method was chosen after comparing it with other interpolation methods (Inverse Distance Weighting, Kriging, Spline) as it was more appropriate for the Richer Stream characteristics with rapid changes between shallow and deep sections. At the watershed scale, topographic points were extracted from stereoscopic pairs using photogrammetric software (DVP Vectorization). The DEM was built from the 3928 acquired topographic points using the Inverse Distance Weighting interpolation method in ArcGIS. The DEM was subsequently used to calculate the area of the drainage basin contributing to the flow discharge at certain cross-sections and to estimate the slope of the Richer channel.

At the cross-section where daily flow depth was measured, the cross-sectional area (m^2) and wetted perimeter (m) is calculated based on the known topography. The hydraulic radius is then calculated using:

$$R = A/P \qquad (1)$$

where R is the hydraulic radius, A is the cross-sectional area, and P is the wetted perimeter. The Manning equation is used to compute velocity at this cross-section:

$$V = \frac{R^{2/3} \cdot S^{1/2}}{n} \qquad (2)$$

where V is the velocity (m/s), S is energy slope (estimated here with the channel slope), and n is the Manning roughness coefficient (dimensionless), estimated at 0.029 for the reach. The discharge (Q) is then calculated using:

$$Q = V \cdot A \qquad (3)$$

The watershed area ratio method was used to compute bankfull discharge from a near-by gauging station on the Hurons River, located 20 km away and with a similar land use (Newbury and Gaboury 1993). The watershed ratio between the Hurons and Richer streams is 23**.** Assuming a recurrence interval of 1.5 years, the Hurons' bankfull discharge is 77.7 m^3/s**,** which results in an estimated bankfull discharge of 3.33 m^3/s for the Richer Stream. A correlation coefficient of 0.91 is obtained between the Richer discharge estimated using equations 2 and 3 and the watershed ratio estimate. Bankfull width (7 m) and depth (0.92 m) at the staff gage are estimated from bankfull discharge, equations 2 and 3, and channel cross-sectional topography. The stream power per unit width (at bankfull discharge) ω (W/m^2) is estimated from:

$$\omega = \tau_0 \cdot V \qquad (4)$$

(Simons and Richardson 1966) where t_0 is the bed shear stress (N/m^2), given by:

$$t_0 = \rho \cdot g \cdot R \cdot S \qquad (5)$$

where ρ is water mass density (kg/m^3) and g is the acceleration due to gravity (m/s^2).

Changes in sinuosity, amplitude, and slope are the main parameters used to quantify the impact of human interventions on the Richer channel. Sinuosity is defined as the length of the meandering channel divided by the length of the channel valley, whereas the amplitude corresponds to the average width of the meander loops. Changes in channel dimensions and pattern along the Richer Stream were reconstructed on the basis of geo-referenced aerial photographs dating from 1932, 1964 and 2006, of legal documentation dating from 1943 to 2006 and of personal communications with residents of the municipality of St-Marc-sur-Richelieu. The temporal evolution of the Richer channel cross-sectional area was traced by reading all legislative Acts regulating channel modifications and maintenance processes (1943 through 1987). For instance, the Act of 25 August 1958 specified that the Richer Stream should have both bed width and depth set at 5 feet (1.52 m) with bank angles at 45 degrees. The Acts of 8 September 1987 specified that the bed width should be increased to 6 feet (1.83 m). This suggests that the cross-sectional area was increased by at least 9.9 percent. However, initial channel dimensions remain unknown.

Natural changes to the straight channel since the latest dredging operation are much easier to assess for the residential reach since both the initial and current cross-sectional shape and dimensions are known. The initial shape is assumed trapezoidal and uniform, with dimensions corresponding to those mentioned in the most recent Act (1987) regulating the Richer Stream management strategy. The current dimensions and shapes are obtained from the interpolated DEM.

The current Richer channel shape in the residential area is examined at 44 cross-sections spaced on average 8 m apart using the topographic map created with the total station surveyed data. Erosion is divided into four types: negligible (little erosion), incision (mainly bed erosion), mass failure (mainly bank erosion), and combined (bed and bank erosion). For each cross-section, the area and the thalweg (position of the deepest point in a cross-section) are measured. Bed shear stress values are calculated between each adjacent cross-sections using equation (5) and mapped to determine the spatial distribution of low and high bed shear stress values.

Results

Watershed scale

The current land use of the Richer watershed is agricultural at 85 percent, forested at 14 percent and urbanized at 1 percent. Spatial analysis using GIS reveals that the distribution and area of each land cover type remained relatively stable since 1932. The only exception to this is the development of a residential area south of the stream. Overland flow into the stream may have been reduced due to the interception of precipitation by municipal sewerage. Simi-

larly, the urban infrastructure and vegetation may have prevented sediment from entering the channel. Since the municipality is located in the downstream part of the watershed, the impact of urbanization on water and sediment supply is limited. In middle and upper reaches, bank vegetation consists mainly of grass with isolated trees and shrubs. A wider vegetation strip with greater plant species diversity is present in some of the lower reaches where a few of the original meanders are still in place (Figure 1a).

In 1932, most of the reaches appear in a natural state. Only a few abandoned meander belts are visible near roads on the aerial photographs dating from that year, suggesting that straightening may have begun before this date near roads and bridges. This section discusses how the channel has evolved in terms of length, sinuosity and slope between 1932 and 2006 and discusses the potential consequences of these changes. Since no accurate topographic representation of the Richer watershed exists prior to 2006, the assumption is made that land morphology has remained relatively stable since 1932, thus that the 2006 DEM can be used to compute channel slope for 1932, 1964 and 2006 planforms. This assumption, based on the fact that land cover has remained fairly stable from 1932 to 2006 (with the exception of the limited urban development), may lead to some error in slope calculations, which is unfortunately not possible to quantify.

On the 1932 aerial photograph, the length of the Richer Stream in its assumed natural state (without considering its tributaries) is 9.1 km, with an average sinuosity of 1.44 and an average slope of 0.094 percent. The average amplitude is 34.3 m (Table 1), with a stream width of approximately 8 m. In 1943, the first Richer Stream Management Act was signed to straighten some sections located in the upper to middle reaches. A part of the lower reach was also straightened, although most of it remained in a relatively pristine state considering the inevitable influence of upstream channel modifications. In 1964, the channel is shortened by about 966 m; as a result, sinuosity decreases and slope increases on average by 12 percent (Table 1). Straightening continued until 1986. After this date, maintenance works were performed in order to counter the channel's natural tendency to retrieve a sinuous shape. An aerial photograph taken in 2006 reveals that the channel is then almost completely linear. However, two downstream sections

Year		Length (m)	Sinuosity	Slope (%)	Amplitude (m)
1932		9079	1.44	0.094	34.3
1964		8113	1.28	0.105	34.0
2006		6863	1.09	0.124	7.4
1964 vs. 1932	1964 - 1932	-966	-0.15	0.011	-7.5
	1964/1932	0.89	0.89	1.12	0.99
2006 vs. 1932	2006 -1932	-2216	-0.35	0.030	-26.9
	2006/1932	0.76	0.76	1.32	0.21

Table 1. Evolution of the Richer channel length, sinuosity and slope for the entire stream.

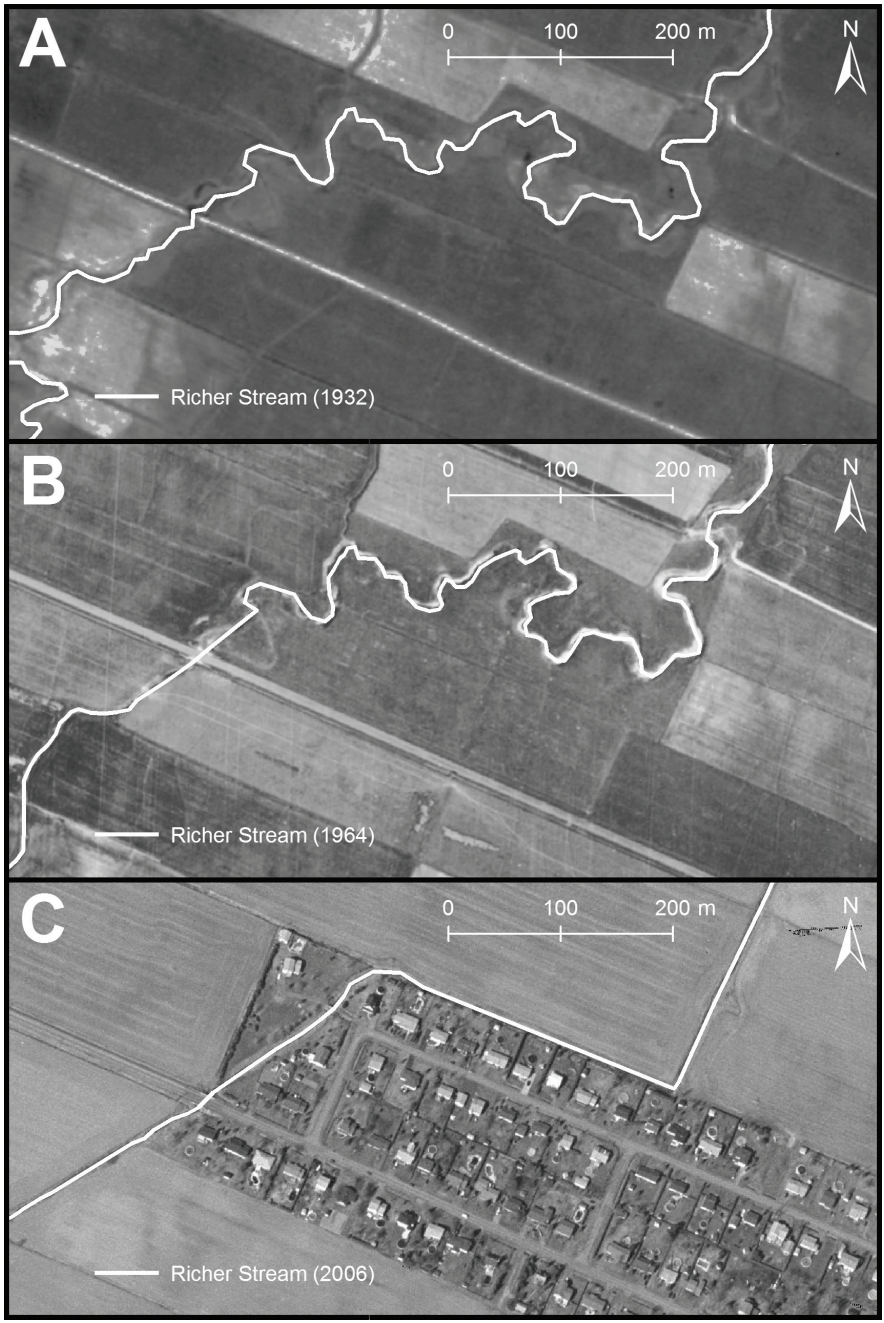

Figure 2. Aerial photographs of the residential reach in a) 1932, b) 1964 and c) 2006. Flow is from left to right.

still retain their natural meandering planform since adjacent landowners always refused to modify the stream. Between 1964 and 2006, the channel length decreased by 2.2 km, resulting in a 32 percent increase in slope (and a corresponding decrease in sinuosity), while the amplitude is dramatically reduced by close to 27 m since 1932 (Table 1).

Residential reach scale

Year		Length (m)	Sinuosity	Slope (%)	Amplitude (m)
1932		898.4	1.76	0.112	57.0
1964		884.2	1.73	0.114	52.1
2006		551.6	1.08	0.183	5.1
1964 vs. 1932	1964 - 1932	-14	-0.03	0.002	-4.9
	1964/1932	0.98	0.98	1.02	0.91
2006 vs. 1932	2006 -1932	-347	-0.68	0.071	-51.9
	2006/1932	0.61	0.61	1.63	0.09

Table 2. Evolution of the Richer channel length, sinuosity and slope in the residential area.

At the residential reach scale, changes in the evolution of the Richer Stream are even more drastic (Figure 2), with an increase in slope of 63 percent, and an amplitude decrease of 91 percent between 1932 and 2006 (Table 2). Since bed shear stress is directly proportional to flow depth and channel bed slope (eq. 5), a major physical consequence of straightening is to increase significantly bed shear stress and stream power values. Assuming a bankfull discharge of 3.33 m^3/s, a bankfull velocity of 0.60 m/s, a trapezoidal channel with 45-degree bank angles, it is estimated that the bed shear stress values have increased from 3.0 to 4.0 N/m^2 (32 percent) on average for the entire Richer Stream and from 3.6 to 5.9 N/m^2 (63 percent) in the residential

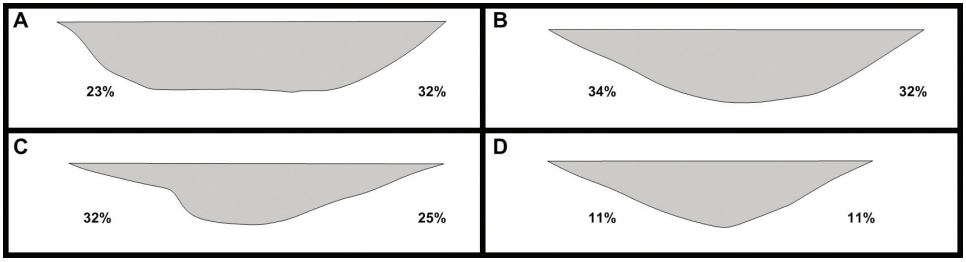

Figure 3. Erosion types in the residential area: a) negligible, b) combined mass failure and incision, c) mass failure and d) incision. Percent values indicate the frequency of left and right banks observed with this type.

Year		Bankfull flow velocity (m/s)		Bed shear stress (N/m^2)		Stream power (W/m^2)	
		Entire stream	Resid. reach	Entire stream	Resid. reach	Entire stream	Resid. reach
1932		0.50	0.55	3.0	3.6	1.5	1.8
1964		0.53	0.55	3.4	3.6	1.8	1.9
2006		0.58	0.70	4.0	5.9	2.3	3.4
1964 vs. 1932	1964 - 1932	0.03	0.00	0.4	0.1	0.3	0.1
	1964/1932	1.06	1.01	1.12	1.02	1.18	1.07
2006 vs. 1932	2006 -1932	0.08	0.15	1.0	2.3	0.8	1.6
	2006/1932	1.15	1.28	1.32	1.63	1.52	1.87

Table 3. Estimated bed shear stress and stream power in the Richer Stream in 1932, 1964 and 2006.

area, between 1932 and 2006 (Table 3). Using equations (4) and (5), the stream power per unit width has increased from 1.5 to 2.3 W/m^2 (52 percent) on average in the entire stream and from 1.8 to 3.4 W/m^2 (87 percent) in the residential reach. These values suggest that the average erosive potential has significantly increased at both scales, but especially in the residential reach.

The analysis of the erosion types encountered in the residential reach reveals that only 27 percent of the 88 banks analysed (two banks per cross-section) are minimally eroded (Figure 3, Table 4). The most common observed erosion type in this analysis is a combination of mass failure and incision (33 percent), followed by mass failure only (28 percent) then by incision only (11 percent). Failed banks are more frequent on the left side (looking downstream) while banks with negligible erosion are more common on the right side, indicating a greater potential for erosion on the left side.

	Negligible			Incision			Mass failure			Combined incision and mass failure			Total
	L	R	Tot.	L	R	Tot.	L	R	Tot.	L	R	Tot.	
Frequency	10	14	24	5	5	10	14	11	25	15	14	29	88
Frequency (%)	23	32	27	11	11	11	32	25	29	34	32	33	100
L = left; R = right; Tot. = total													

Table 4. Erosion types in the 44 sampled cross-sections of the residential area.

Calculations of the average channel dimensions in the residential area reveal that although the channel cross-sectional area has remained relatively stable over time, a marked decrease

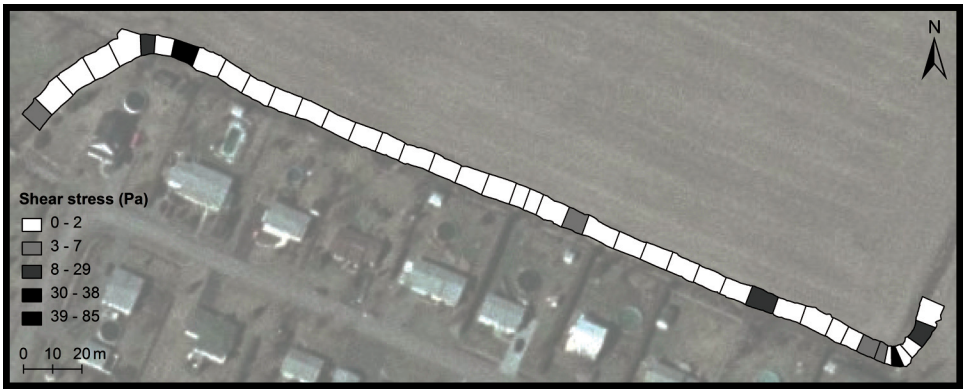

Figure 4. Estimated bed shear stress values in the residential reach. Flow is from left to right.

in depth (24 percent), increase in width (43 percent) and decrease in bank angles (up to 50 percent) are visible. The thalweg position has also shifted by 12 percent of the channel width towards the left bank (looking downstream). This is consistent with the observations that more erosion is occurring on the left bank. The magnitude of the changes and the speed at which they operated suggest that a trapezoidal channel lacking protection is unstable and that the channel naturally adapts by adjusting all dimensions and migrating to the left.

The analysis of individual cross-sections also revealed that bed shear stress distribution is not uniform in the residential reach (Figure 4). Although the average calculated bed shear stress is around 4.0 N/m^2 in 2006, a twentyfold increase in estimated shear stress values is observed in the cross-sections immediately downstream of the two bends, suggesting a high potential to erode bend banks. High bed shear stress values are also visible upstream of the second bend which is a zone with a massive failure of the right bank that constricts the channel cross-sectional area.

Discussion

Our results indicate that an important consequence of channelization in the Richer Stream is the decrease in length resulting in a corresponding increase in channel slope. At the scale of the watershed, the increase in channel slope (32%) corresponds well to observations in Indiana (33%; Brookes 1988) and Illinois (23%; Rhoads and Herricks 1996). However, the increase in the residential sector is markedly larger (63%) than previous observations. Such an increase results in higher bed shear stress values, which were found to be abnormally high in a bend located in the residential area where bank failures were observed and where the channel is in general unstable.

The detailed analysis of cross-sections in the residential reach of the Richer Stream provided useful information about the nature and evolution of the straightened channel adjustments.

Firstly, erosion types show that both incision and bank failures occur. The observed channel`s widening and sediment accumulation on the bed suggest that incision may cause bank failure which itself leads to sediment accumulation on the bed as the sediment forming the collapsed banks are dispersed. Secondly, the development of a sinuous thalweg was observed while the channel also became slightly more sinuous. Similar changes were observed in the Big Pine Creek, Indiana, a watershed that is similar to the Richer Stream in terms of watershed area, soil type and sinuosity (Brookes 1988). Six years after its construction, the Big Pine channel experienced incision, bank slumping, widening and the development of higher sinuosity. Our observations in the Richer Stream follow the sequence of adjustments following river straightening described by Brookes (1988), namely bed degradation (followed by bank slumping), armouring, development of a sinuous thalweg, sinuosity recovery, and the development of a sinuous course by deposition.

Bank failures were found to be more common on the left bank. This may be attributed to the fact that the agricultural land on the left bank is more vulnerable to mass movement than the residential land on the right bank, which is protected by roots, stems and leaves from deciduous and coniferous trees, shrubs and grass species throughout the year. Failures may also be related to heavy machinery used on the agricultural side which promotes bank damage.

The findings concerning the evolution of the dredged channel in the residential reach are derived from a single sequence of topographic data acquisition. The main limitation of this procedure is its inability to detect the temporal and spatial connections between erosion types, thus to capture the detailed channel evolution following disturbance. A potential improvement in the understanding of the re-meandering processes could be achieved by acquiring topographic data in the study reach several times during a period of several months, particularly following flood events. An alternative could be to install erosion pins along the stream banks and measure the rate of erosion on a regular basis (Lawler 1978; Couper et al. 2002). However, the method used here remains a useful first approach in stream management to highlight potential problems and elaborate solutions in the short term.

In this study, average bed shear stress values are estimated for each uniform section of the channel using Equation 5. Other methods to compute bed shear stress using mean velocity or turbulence fluctuations are available (Biron et al. 2004b; Tilston and Biron 2006), which may have been more accurate than the basic equation used here. However, the latter requires only topographic data, which are easily available.

Our findings suggest that the removal of riparian vegetation associated with recurrent dredging activities decreases the Richer channel stability. The fact that the channel naturally adjusted to disturbance by decreasing bank slopes by half while decreasing its depth and maintaining a constant cross-sectional area suggests that bank angles were too steep and points to a lack of bank cohesion. This was also observed by Micheli et al. (2004) who found agricultural floodplains to be 80 to 150 percent more susceptible to erosion than riparian forest floodplains. Soil strength could be increased compared to bare soil by maintaining a riparian vegetated strip consisting of woody and grass species. The net effect of this approach was found to vary with plant species assemblage and moisture content (Simon and Collison 2002; Simon et al. 2006). However, a riparian strip constituted from a combination of shrubs and trees is expected to

enhance vegetation colonization and channel narrowing (Malkinson and Wittenberg 2007).

River management options

Several solutions to bank instability exist, however their use is not always desirable or possible in an agricultural context and under all circumstances. Furthermore, potential solutions are not necessarily the same at the watershed and residential reach scales because of the different contexts and objectives to attain in each case. For instance, the elaboration of solutions for the residential reach must take into account the very limited available space for the installation of vegetation and hydraulic structures. A wider range of modifications is possible at the watershed scale due to the low density of roads and buildings, but they must be affordable and implementable at a large scale. In this study, two assumptions were made. Firstly, the residential area cannot be moved or reduced in size due to the important costs and efforts that such options would require. Secondly, the agricultural field could be slightly modified in size in exchange of potential financial subsidies from the provincial government to the land owners. These assumptions imply that either the solution must be implemented with significant space constraints or the channel has to be moved.

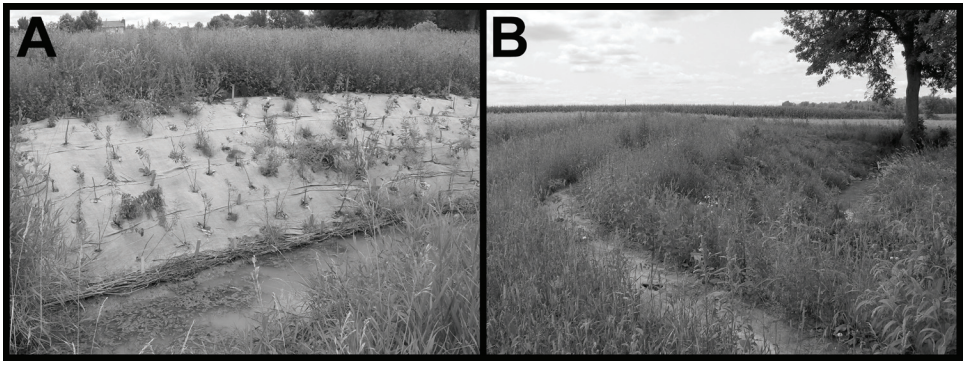

Figure 5. Examples of channel bank stabilization with vegetation and bioengineering implemented in a downstream reach of the Richer Stream in 2007. a) Flattening of the over steepened bank slopes, installation of cardboard-coco mat and plants to protect banks, and installation of trellised branches to prevent bank toe erosion. b) Rows of trees planted to promote bank cohesion with root reinforcement in the long term.

The agro-environmental group *Club Consersol Vert Cher* has implemented bioengineering solutions in May 2007 in one of the few meanders located in the lower reaches of the Richer Stream (Figure 5). Bank inclinations were reduced from 1:1 to 1:1.5 to decrease mass failure potential. A jute or coco mat was used and placed over a cardboard mat in a few channel bends. The former type was entrained by spring flood while the latter resisted. The establishment of plants on the cardboard-coco mat was more successful than on the cardboard-jute mat. Although some of these results are encouraging, only time will confirm whether the techniques used are sustainable in the long term.

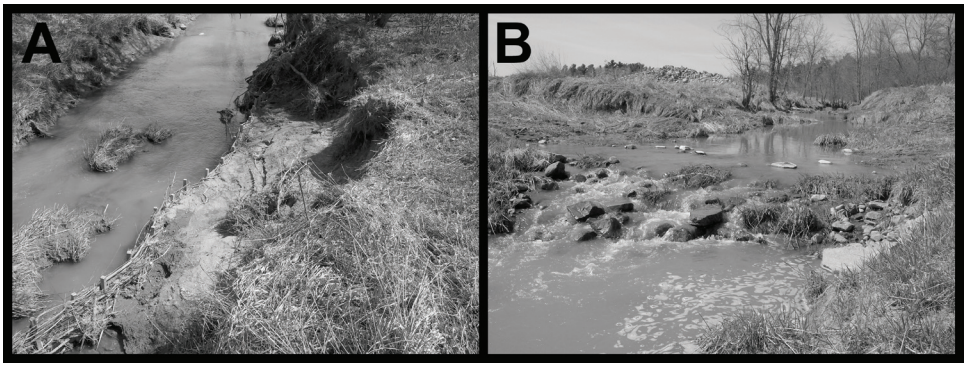

Figure 6. Hydraulic structures currently being used in the Richer channel to improve bank stability. a) Vertical pillars installed in 2007 and used to reduce bank toe erosion. Flow is towards the top. b) Block ramp installed by a farmer in 1997. Flow is towards the bottom.

Some hydraulic structures such as vertical pillars have been in place in the Richer Stream and have proved successful so far (Figure 6a). Not only did flow velocity decrease near the bank, but the area between pillars and the right bank (looking downstream) was filled with sediments that otherwise would have eroded into the stream. This adjustment, also observed by Abam (1995) helped the channel maintain its depth. However, in the long term, the area between the pillars and the right bank would probably become completely filled and this technique would not be able to trap any sediment. Also, the pillars may collapse and release previously trapped particles (Abam 1995). A block ramp was also installed during the summer of 1997 and seems helpful in dissipating energy and decreasing flow velocity at low discharge (Figure 6b). Block ramps increase flow resistance while reducing shear stresses on the base material (Pagliara and Chiavaccini 2006). However, the fact that significant bank failures occurred 50 m downstream of the ramp suggests that this method alone cannot solve bank erosion problems. An environmental limitation of using this structure in the Richer Stream is that it completely obstructs fish migration at low flow (Thompson and Stull 2002). A general limitation of installing any structure is that increasing resistance to erosion without modifying flow energy usually results in increasing erosion downstream, therefore displacing the problem to another location (Jueyi et al. 2006). Also, the impact of these structures varies with flow stage. For example, three-dimensional numerical simulation was conducted to test the effect of five bendway weirs on bank toe protection in Sugar Creek, Illinois (Abad et al. 2008). This study revealed an increase in shear velocities on the bed in the lee of these structures and along the outer bank above the top of the structures at medium- and high-flow stages.

Naturalization, or controlled natural state, consists in limiting human interventions in the channel structure and letting the river self-adjust within a certain reserved riparian area, which also has the benefit of increasing ecosystem structural (physical) diversity and quality, and heterogeneity in vegetation community (Toth 1996; Larsen and Greco 2002, Piégay et al. 2005). Naturalization can be implemented with dechannelization, the relocation of a stream

inside its historical channel and ecosystem; this solution helps restore geomorphic features, diversity and functions quickly (Toth 1996). However, the Richer Stream cannot be relocated inside the 1932 channel in the residential area as the channel has been filled for agricultural purposes and as the municipality of Saint-Marc-sur-Richelieu was established over the former planform. Instead, the channel could be altered to exhibit historical stable planform, shape and dimensions, knowing that the resulting channel would also be relatively stable. Since the municipality of Saint-Marc-sur-Richelieu was planning to expand its residential area next to the river (upstream and downstream), a naturalization solution was proposed to its Administration Council in January 2008 to prevent eventual land losses and damages to infrastructure and future dwellings, and environmental degradation associated with dredging practices. Using aerial photographs, it was estimated that the historical stable channel-pattern amplitude (exhibiting negligible lateral or downstream migration rates and having a 10-m wide channel) occupied a zone with an amplitude of 44 and 42 m upstream and downstream of the residential area, respectively. A suggestion was thus made to use 17- and 16-m wide riparian areas on both sides of the stream respectively for the northern and southern development sites (Figure 7). These values correspond to the amplitude less the channel width (10 m), divided by two. Although it was felt that leaving such a corridor undeveloped would limit future needs for stabilization and notwithstanding that no long-term comparison of costs was completed, this solution was rejected by the council for financial reasons. Instead, the administration council maintained their idea of establishing a 13-m wide corridor, which is 3 m larger than what is required by the provincial law.

Figure 7. Potential solution consisting in the naturalization of two parts of the Richer channel that are located near future residential developments. The width of the riparian zone for the two proposed development is based on the natural (1932) meander amplitude for each zone.

During the meeting with the municipality council, solutions involving planform and morphology alteration were discussed. The council proposed to move part of the channel so that its natural adjustment in shape and dimensions would become less problematic for current and

future residential land owners. The characteristics of the desired stable meandering channel pattern can usually be determined from historical measured geometrical parameters such as sinuosity, slope, amplitude, wavelength and width (Shields et al. 2003). However, it is not possible to proceed that way for the current solution since the mean slope would be increased significantly as a result of the valley length being shortened by 28.4 percent with respect to the 1932 planform. In order to maintain the 1932 slope, a sinuosity of 2.34 would be required in the shorter valley. Such a high value of sinuosity is undesirable in this reach as it would drastically contrast with much lower values in adjacent reaches, creating potential backflow problems when the faster upstream flow would enter this high sinuosity reach. A new combination of amplitude and wavelength was determined to design a channel having a sinuosity of 1.29, i.e., the sinuosity required to keep the 2006 slope in this section of the stream. In this solution, channel planform is elliptical and its wavelength is derived from Ramanujan's (1914) first approximation of an ellipse perimeter (P):

$$P \approx \pi \left\{ 3(a+b) - \sqrt{(3a+b)(a+3b)} \right\} \qquad (6)$$

where a and b are the lengths of the semi-minor and -major axes, respectively. The relation between channel amplitude (A) (m) and wavelength (L) (m) for a specific sinuosity is then described using a linear equation:

$$L = m \cdot A + y \qquad (7)$$

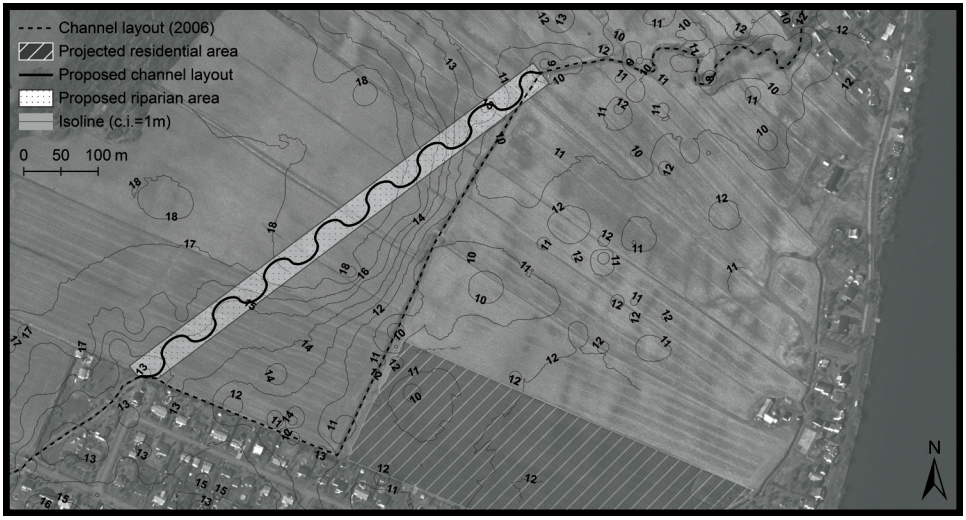

Figure 8. Potential solution relying on the migration of part of the Richer channel from the residential area to an agricultural zone to limit bank erosion and flooding problems in the residential sector.

For instance, m is equal to 3.26 and y is equal to $6.19 \cdot 10^{-15}$ in a channel exhibiting elliptical planform if the sinuosity is 1.29. The value of parameters m and y was determined knowing that L is equal to four times the length of the semi axis that is parallel to the valley and A is equal to twice the length of the semi axis that is perpendicular to it.

Using this equation, a compromised planform between the 1932 amplitude and wavelength would include a 26-m amplitude and an 86-m wavelength. This situation would result in a mean channel width of 9 m, based on the relationship with the distance between two consecutive pools (5 to 7 channel widths). The total riparian vegetated strip width would be 35 m (Figure 8). Note that uniform planform geometries or channel width, depth and slope should not be employed; the calculated values should only be used as average values for the designated reach (Shields et al. 2003). Since the elevation near the projected channel bank tops is on average 4 m higher than it is near the current channel, approximately 0.5 million cubic meters of soil would need to be moved in order to level the terrain and establish the stream in the lowest elevation zone.

An intermediate solution consists in combining the establishment of a riparian vegetated strip and minor planform and shape modifications (Figure 9). The curved planform in the area downstream of the residential area decreases flow impact at the location where bed shear stress values were estimated to be the highest. The riparian areas stabilize banks and provide the channel with enough space to adjust laterally.

Figure 9. Potential solution relying on planform and shape alterations, stabilization with vegetation and bioengineering techniques, and naturalization.

Other stabilization solutions for the residential area require the channel to be minimally shifted towards the agricultural side. For instance, reducing the Richer bank angles by half would imply that the channel is approximately 3-m wider than it currently is.

Conclusion

This study aimed at improving our understanding of the impacts of channel straightening and dredging in a small agricultural watershed, but also at identifying some sustainable solutions that could be implemented in a reach flowing between a residential area and agricultural lands to reduce the problems associated with bank erosion in a way that is ecologically acceptable.

River straightening had a marked impact on the Richer Stream, with an increase in slope of 32 percent at the watershed scale, and a corresponding decrease in sinuosity. At the residential reach scale, the increase in slope is even more dramatic (63 percent), resulting in a marked increase in bed shear stress and stream power. Only six years after the last dredging operation ended, the channel was found to have adjusted naturally to compensate for its unstable condition with a 100 percent reduction in the angle of over-steepened banks, a significant shift in thalweg position towards the left bank, a 6 percent increase in sinuosity, and an equivalent reduction in channel bed slope.

The geomorphological characterisation of the Richer Stream allowed the identification of solutions that could improve channel bank stability. Using the geometrical parameters of the 1932 Richer planform, an increased riparian vegetated strip width in which the stream would be "free" to re-initiate meanders is suggested upstream and downstream from the current residential area, where more space is currently available but where new residential developments are planned in the near future. This solution should be combined with a planform alteration in the artificially-maintained sharp bends to implement a more natural and sustainable channel.

Often, in the public's mind, erosion is regarded as a problem. This conception ignores the fact that rivers are dynamic; lateral migration of meanders and floods are natural and inevitable processes. Efforts should be placed on understanding these natural processes and considering them in the planning phase of various projects involving rivers instead of trying to control them. Also, stream management should be analysed from different perspectives; cooperation among experts from different domains (geomorphology, engineering, agronomy, policy makers, and municipal representatives) and the community is needed in order to implement more sustainable solutions for agricultural watersheds.

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Notes

1. The Fondation de la faune du Québec was created in 1986 by the Government of Québec to mitigate loss of wetlands and to fight aquatic and land habitat degradation by supporting wildlife initiatives (http://www.fondationdelafaune.qc.ca).

2. The Union des Producteurs Agricoles du Québec was created in 1972 to promote, defend and develop the professional, economic, social and moral interests of Québecís farm producers. In addition, it seeks to improve living conditions of rural communities at the social, economic and cultural levels (http://www.upa.qc.ca).

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Reviews

NEW ENGLAND AND THE MARITIME PROVINCES:

Connections and Comparisons

Stephen J. Hornsby and John G Reid, eds.
Montreal: McGill-Queens University Press, 2005. Xii, and 411 pp.
ISBN: 0-7735-2865-2

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New England and the Maritime Provinces is a well-conceived and ably edited collection of original essays designed to "focus on the complementary themes of connection and comparison" (p. 10) as they relate to the cultural, social, economic, and environmental histories of New England and the Maritimes. Edited by Stephen Hornsby, a geographer and Director of the Canadian-American Center at the University of Maine, and John Reid, a professor of history at Saint Mary's University, *New England and the Maritime Provinces* stands out as an exemplary collection, both for the quality of its individual essays and the quality of its editing.

Collectively, the book contains 19 chapters (including the book's introduction), written by fifteen historians, two geographers, and five authors from an assortment of other fields and backgrounds. The contributors are evenly split between Canadian and American institutions.

For anyone with an interest in the history of New England or of the Maritimes, this collection deserves attention. On the one hand, it successfully convinces us to view a relatively narrow regional configuration like "New England" according to a larger frame of reference based on comparison and connection. This reminds readers to remove regional blinders and to seek out more nuanced views of interconnectivity and difference between regions. On the other hand, *New England and the Maritime Provinces* is a model of success as an edited volume. Too often, edited collections feel disjointed or "thrown together," seemingly lacking in editorial guidance. By contrast, nearly all the essays in *New England and the Maritime Provinces* hang together nicely, speaking to common themes, and stating their arguments in clear, forceful, and cohesive ways. Authors routinely take concepts or arguments that very often stand alone in their respective bodies of literature (nineteenth-century nativism comes to mind as one example) and refashion or re-enliven them by placing them within a more specific "borderlands" context. How, they ask, might we rethink concepts we may already be familiar with by tracing the history of those concepts as they played out in or between New England and the Maritimes? It is that kind of analysis which makes this volume sharp, fresh, and often surprising, and it is that which makes it a volume whose importance and readership should extend beyond the regions it explores.

The book begins with an introductory chapter by Hornsby and Reid placing the book within the framework of borderland studies both in the United States and Canada. This dual focus on Canadian and American historiography is a core challenge for a book like this, but it is one that

the authors collectively meet well. (Indeed, one does not need to be entirely conversant in past or present scholarship on New England or the Maritimes to follow the book's introduction or its chapters. By and large, the essays articulate their positions relative to the literature in inclusive rather than exclusive ways.) As Hornsby and Reid explain, the book's "critical and analytical approach to both connection and comparison" allows it to tackle a history of trans-border regionalism in ways that stand to inform how we understand contemporary concepts such as globalization and transnationalism.

Following the introduction, the book moves into a series of chapters on the region's pre-colonial and colonial periods. Here the authors cover ground ranging from Native archaeology to economic history to the place-based and cultural perceptions of soldiers and other travelers. One essay stands out notably among the book's first 100 pages—Elizabeth Mancke's exploration of "spaces of power" in the early Modern Northeast, in which she decenters traditional historical narratives based on a "colonial" perspective in favor of a more complex and highly compelling focus on "systems of social power" based on economic, political, cultural, and military contexts.

The majority of the book's remaining chapters focus on the nineteenth century (while a couple spill over into the early twentieth), and as before, they range widely across topics while still retaining their focus on comparisons and/or connections between New England and the Maritimes. Here we move from an essay on smuggling that is both fun and insightful, to others on topics that include nativism, urban-economic history, folklore of lumber camps, fisheries policy, gender and cross-border migration, and fish and game management, among others. Particularly notable among the book's later chapters is Colin D. Howell's uniquely conceived chapter on transnational sporting culture in the early twentieth century. In this essay, Howell creatively traces the ways in which New England and the Maritimes were linked culturally through shared interests and encounters in baseball, sailboat racing, the Boston Marathon, and big game hunting, arguing that Maritime sporting culture was more closely linked to New England prior to World War Two than to the rest of Canada, suggesting again, the danger in granting too much argumentative authority to national boundaries.

Two conceptual chapters round out the book. In the first of these, Reginald C. Stuart and M. Brook Taylor ambitiously argue that comparative analyses of New England and the Maritimes necessitate the creation of a larger set of themes and a larger historical periodization capable of articulating an "epic of greater North America." This epic, they argue must be crafted in a way that allows scholars to "plot historical parallels and shared themes while still respecting national boundaries, the jurisdictions they enclose and the ways in which the neighboring societies remain distinct (p. 281)." The second conceptual chapter is an engagingly critical review of the book's essays written by geographer Graeme Wynn. Wynn's critique centers on essentially two points, each of which returns to a common theme. First, Wynn argues that the book's essays tend not to theorize the concept of boundaries/borderlands as much as they should. And second, Wynn notes that the essays collectively fail to engage "comparisons" between the regions as much as "connections," despite the promise of both terms in the book's title. The problem with both of these shortcomings, Wynn asserts, is that they tend to mute the differences that do exist between the regions. He writes: "In sum, it is fine to think about connections, but not at the expense of inquiry into the differences and the ways in which these connections are

constructed" (p. 303).

Wynn's critiques are thoughtful, well-written, and well-informed. They are also "forcefully" stated (to use Wynn's own characterization of his essay), and so need to be evaluated carefully by individual readers, for while I can agree with many of his points and was moved by them, I also feel that the book's merits outweigh the force of Wynn's criticisms, which some might read as verging on a condemnation of the entire project.

Two additional, small critiques do come to my mind. First, the book's focus on New England is heavily weighted towards Maine, which makes sense considering that state's proximity to and close historical connections with the Maritimes. But I was eager to learn more about connections to other parts of New England. Boston figures prominently in the book, as one might expect, but what did the relationship between the Maritimes and other states such as Vermont or Connecticut or Rhode Island look like? There is less mention of this in the book, and perhaps for good reason, yet I never felt this was addressed as completely or directly as it might have been. (Notably: I did not feel this imbalance about coverage of the Maritime Provinces, which seemed more diverse and inclusive overall.) Second (and as one sees so many times in reviews by geographers) I might have liked to see a more detailed regional map with more physical features labeled. These are small criticisms, though, and neither from my perspective undermines the fact that *New England and the Maritime Provinces* deserves high praise. The book gives readers refreshing examples of capable scholarship, both from the authors and the editors, and as such it serves as a model for how to succeed in telling regional and comparative histories, as well as for how to succeed in creating an edited collection.

PLACING HISTORY: HOW MAPS, SPATIAL DATA AND GIS

Are Changing Historical Scholarship

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Placing History: How Maps, Spatial Data, and GIS Are Changing Historical Scholarship edited by Anne Kelly Knowles is a highly engaging and interesting book that would appeal to both students and scholars in social science since it shows how and why GIS and spatial modeling may add value to historical enquiry. The authors clearly demonstrate how GIS can transform our understanding and appreciation of key historical events such as the Battle of Gettysburg, the Dust Bowl, and the Irish famine.

The book is organized into ten loosely linked chapters written from different perspectives, each layering the foundation on how history can be explored, analyzed, mapped and interpreted through geographic science. Chapters one, three, five and seven are more theoretical and discuss how the coupling between history and geography can occur via GIS while the remaining chapters, two, four, six , eight and ten focus on the applications of historical GIS.

Chapter 1 by Anne Kelly Knowles on "GIS and History" succinctly explains the relationship between history and spatial thinking and GIS. Particularly important are the three themes, *history of land use and spatial economies, reconstruction of past landscapes and infrastructure projects*. Anne Kelly Knowles articulates the challenges in each area, including uncertainty in representing historical information. Chapter 3 by Robert Churchill and Amy Hillier consists of two parts, the value of GIS in liberal arts education and a guide to teaching historical GIS. This chapter tries to weld the value and practice of teaching GIS in history using the multi-faceted urban history of Philadelphia. Chapter 5 by Ian Gregory introduces the readers to advanced methods including spatial interpolation, univariate and multivariate techniques. Particularly compelling is the Irish famine study using geographically weighted regression. In Chapter 7, entitled "Combining Space and Time: New Potential for Temporal GIS," Michael Goodchild sketches what a historical GIS should be and outlines the many challenges in deploying a GIS that can fully deal with dynamic and temporal data.

Historians frequently deal with hand drawn maps, unconventional data sources, and historical narratives that need to be integrated for analysis. Historians study events ranging in scale from global to local. The remaining chapters demonstrate how GIS is shaping such historical research. In Chapter 2 ("Creating a GIS for the History of China") Peter K. Boll highlights the

difficulty in creating a GIS database for documenting the history of Chinese towns and villages. The fundamental issue is representing spatial information characterized by spatial uncertainty. Towns and villages are better represented as nodes and networks instead of administrative units. Chapter 8 by Richard Talbert and Tom Elliot, examines the Peutinger map of the Roman world. Using traditional GIS analysis such as map overlay, features extraction and network analysis, the beautifully hand drawn maps are layered into a GIS database revealing the subjectivity in map generalization and distance distortions in these historical maps. This chapter is essential for researchers creating historical digital atlases of regions as well as anthropologists and archaeologists unearthing trading and settlement patterns from old maps.

Chapters 4, 6 and 10 deal with historical events and processes at regional and more local spatial scales. Chapter 4 by Geoff Confer shows how climatological data and simple GIS mapping can be effectively used to gain a better understanding of the landuse changes in the Dust Bowl region of the US during the nineteen twenties and thirties. Chapter 6 by Brian Donahue adopts a local parcel level GIS mapping of landownership patterns in Concord, Massachusetts to discuss historical land use transformation during the colonial period. This chapter emphasizes the early agro-ecological organization of mixed husbandry. My favorite chapter in this set is Chapter 10 that models the battle of Gettysburg from the perspective of a GIS and compares it with the Army Corp of Engineers re-creation using a more traditional method. I highly recommend this chapter to history buffs and military historians to grasp how topography and landform shaped the famous battle.

I like this book, but two things niggled me. First, the chapters were organized in a rather confusing manner. This loose organization leaves the reader confused about the central themes as well as methods. It could have been organized along the lines of this review or in some thematic fashion suggested in Chapter 1. Each section could have been preceded with an introduction. Second, I was a little unsure as to the intended audience of the book. From the perspective of the students in history, this book is daunting. What is missing here is a basic chapter in GIS that could have provided more fundamental GIS concepts. The two chapters on GIS methods by Goodchild and Gregory are very useful chapters but are not introductory in nature and require a greater understanding of GIS methods and spatial statistics. However, these two limitations in no way detract me in recommending this highly informative, and stimulating book on incorporating GIS into history. Kudos to the authors on promoting this promising field!

SOUTHEAST ASIAN REFUGEES AND IMMIGRANTS

in the Mill City: Changing Families, Communities and Institutions - Thirty Years Afterwards.

Tuyet-Lan Pho, Jeffrey N. Gerson and Sylvia R. Cowan, eds.
Burlington: University of Vermont Press, 2007. Xiii and 227 pp.

Reviewed by Pablo S. Bose,
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Research and publication on refugee experiences and contexts has long been dominated by a handful of key approaches. One prominent school of refugee studies has focused on the legal arena, comprised of the international laws, covenants and treaties that aim to protect refugee rights and otherwise shape the global refugee determination regime. Another area of scholarship has focused on the conditions of and motivations for departure—the civil wars, ethnic conflicts, natural disasters and environmental changes, economic hardships, long-term oppressions, and developmental projects that have forced specific populations and communities to migrate. Much less has been written regarding the resettlement experiences of refugees within new countries and host communities. It is perhaps not surprising therefore that the images of refugees that dominate public perception and discourse are often ones of poverty, trauma, victimization and despair. Yet the story of refugee adaptation and acculturation in new homes and new lands is an important one that is slowly emerging from a diverse range of contexts and locations, speaking to the experience of North Africans in Southern Europe, Afghans in Pakistan, Palestinians in Lebanon and Egypt, Somalis in Canada, or Bosnians in the United States, to take but a few examples. The analysis of such cases joins with an extant – if still limited – body of literature that has explored the experiences of older waves of refugees, especially following the Second World War. Together these accounts paint a picture of resilient and vibrant communities that survive and indeed thrive despite struggling against a steep learning curve coupled with systemic constraints, social exclusion, xenophobia, and often racism. Stories of immigrant settlement are crucial to recount and analyze, therefore, as a way of redefining refugee communities as active participants in reshaping our increasingly globalized world.

In the United States publications on such experiences are especially scarce, other than those that discuss the earlier waves of refugee arrivals. In part this has to do with the newness of the most recent arrivals. Refugees from Central and Eastern Europe and the former Soviet Union have been in the United States for less than ten years on average, while those coming from Africa have only arrived in significant numbers in the last five or six years. One group that has established itself in North America (and especially the United States) over a longer duration are those groups that fled Cambodia, Laos and Vietnam in the late 1970s. A diverse group of refugees—including former allies of the United States in its conflicts in the region, those escap-

ing the Khmer Rouge's genocidal reign, and families driven abroad by regional wars and ethnic strife—several of these Southeast Asian groups settled in the United States; most in California, but with significant populations in Texas, Minnesota, Florida, Washington, Louisiana, and Virginia. Because they have been in the US in some cases for over thirty years, several studies have been published in recent years that have been able to conduct more of a longitudinal assessment of the resettlement experience of Southeast Asian refugees.

Southeast Asian Refugees and Immigrants in the Mill City: Changing Families, Communities and Institutions—Thirty Years Afterwards is a particularly fine contribution to this emerging literature. It is especially unique in that it focuses on the specific context of the Southeast Asian refugee experience within the Northeastern United States, in the case of the mid-sized New England city of Lowell, Massachussets. In a wide-ranging collection of essays, contributors from a diverse set of disciplinary backgrounds examine the struggles of the various Southeast Asian groups to adjust to a new life, new beliefs and cultural expectations while maintaining a distinct sense of communal identity. The very strong sense that one gets from the various chapters – on education, language, social networks, secondary migration, civic engagement and public discourse – is that the refugees themselves have struggled hard and succeeded in being narrators of their own lives. The volume does not suggest that the processes are either straightforward or monolithic, however; Jeffrey Gerson's "The Battle for Control of the Trairatanaram Cambodian Temple" highlights internal divisions and struggles for power over political as well as religious identities within a particular part of the community. Sylvia Cowan's "Lao Refugees in Lowell: Reinterpreting the Past, Finding Meaning in the Present" similarly shows the contentious nature of relationships with the homeland, both in memory and in the contemporary moment. Other chapters, such as Leakhena Nou's "Exploring the Psychosocial Adjustment of Khmer Refugees in Massachussets from an Insider's Perspective" argue that it is not only cultural adjustments with regard to language, education, and economic opportunities that we must pay attention to, but equally the post-traumatic experiences of refugees who are fleeing conflict zones.

The wide range of disciplinary perspectives that the volume draws upon – including anthropology, political science, economics, sociology, education and psychology—means a collection that is uneven at times in its presentation and style. Some of the chapters also read as more works in progress or recommendations for further research than fully-fleshed narratives. Such limitations are not uncommon in collected editions, however, and do not detract from the considerable contribution that this excellent volume makes to the literature on both global as well as US refugee studies. *Southeast Asian Refugees and Immigrants in the Mill City: Changing Families, Communities and Institutions* is therefore highly recommended for scholars and students at both the graduate and undergraduate levels in a range of disciplines as well as for policymakers and community activists concerned with issues of refugee resettlement and social justice.

MAPPING A CONTINENT: HISTORICAL ATLAS OF North America, 1492-1814

by Raymonde Litalien, Jean-Francois Palomino, and Denis Vaugeois,
McGill-Queen's University Press, Montreal, 2007. 298 pp. hardcover, ISBN: 978-2894485279

Reviewed by Kurt Schroeder,
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This impressive book is a good introduction to the historical cartography of North America. Written by a trio of distinguished Canadian historians and historical cartographers, it offers a synoptic view of a lengthy period in the history of cartography. This edition is a translation of the French original.

> The best thing about this book is the reproductions, which are, with a few exceptions probably due to excessive magnification, excellent. Of course, the quality of each map depends to a great extent on the quality and state of the original; these improve in the later chapters. The book includes, in addition to the many maps, many side illustrations that add much to the feel of the book and the immersion into the time period. The text is ably and vividly translated by Käthe Roth, and preserves the lively flavor of the French original.

The book is divided into four sections:

1. Landing in North America, about the discovery of the Americas and early explorations
2. Exploring and Mapping North America, about settlement during the Seventeenth Century
3. Conquering North America, about the settlement up until the time of the British Conquest
4. Crossing North America, which covers a few special topics of later interest.

Thus, the coverage is effectively limited to the time period before the British conquest of French Canada.

The limitations of the book are minor and two-fold. First, the selection of materials in the first three sections seems to favor French-made maps of French North America. This may be a result of the maps available, the research proclivities of the authors, or some combination of the two. Also, the Anglo-American and perhaps the Spanish maps of this era are more widely accessible, and concentrating on those maps that are not readily available elsewhere is an understand-

able allocation of resources. The second, and related limitation, is that the text seems to favor to some degree the French side of the historical story. Positive aspects of the French relations with the First Nations are emphasized, while the English and Spanish are portrayed in a more negative light. Although these limitations restrict somewhat the utility of the book, the excellence of the reproductions and the selection of many undeservedly obscure maps make this book a positive experience.

It is obvious from the moment you open the book that this is a work of love and respect for the field of history and historical cartography. This book is highly recommended for libraries and for anyone who is interested in the cartography of North America.

FRANCONIA NOTCH AND THE WOMEN WHO SAVED IT

by Kimberly A. Jarvis,
University of New Hampshire Press,
University Press of New England, Lebanon, NH, 2007. 232 pp.
paper, ISBN: 978-1584656272

Reviewed by Bryon Middlekauff,
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This study grew out of a history seminar at the University of New Hampshire and following that a doctoral dissertation. Dr. Jarvis is currently on the faculty at Doane College in Crete, Nebraska.

This well-researched, extremely detailed examination of the movement to preserve Franconia Notch, New Hampshire is subdivided into eight chapters. Dr. Jarvis begins by discussing briefly the physical geography of the White Mountains and the Notch. She also effectively details the exploration and tourism history in the region, reviewing accounts from guidebooks, poems, fiction, drawings and paintings from the 19th century. The romantic notion of wilderness was spread by way of these media, encouraging people of the northeast to experience the frontier before it disappeared. Franconia Notch drew visitors very early in the history of New England tourism, well before any accommodations existed there.

She relates that the August 1826 landslide, stemming from a prolonged heavy rainfall event which killed the entire Willey family in Crawford Notch, attracted a great deal of attention, and subsequently, early tourists to the region. The story appeared in newspapers, magazines, scientific journals, and guidebooks.

Other features in the White Mountains and Franconia Notch, such as the Basin and the Flume, and Cannon cliffs gained notoriety in the late 19th century. Thomas Starr King proclaimed their majesty in a guidebook while Nathaniel Hawthorne wove several tales about the White Mountains, their beauty and uniqueness. Jarvis also discusses the "mystique" which developed around the Old Man of the Mountain as engravings, drawings, and later, photographs began to appear in publications. The Old Man became a symbol of New England stoicism and grittiness.

She recounts that tourisim to the region was facilitated, as the upper middle class and the wealthy, reached deeper into the landscape first by stage coach then by rail. Accessibility continued to improve after the Civil War, bringing thousands of tourists to the region. With the expansion of cities in the northeast and their attendant pollution and summer heat, throngs were attracted to the White Mountains for their beauty, cooler summer temperatures, and clean air. Hotels were constructed to accommodate these visitors, and rail lines extended to facilitate

travel; the local environment began to feel the effects of increasing visitation.

The growth of cities in the northeast exerted pressure upon the White Mountains and ultimately Franconia Notch in another way, too. Timber cutting, driven by the need for wood products, employed a method where every tree, whether useful or not, was removed from vast tracks of land (clear cutting). The "rapacious timber cutters" as they were viewed by some, already having harvested trees from throughout the White Mountains, had their designs upon Franconia Notch. It was clear to many that though Franconia Notch was impressively beautiful, an outstanding subset of the White Mountains and had escaped the axe up to the late 19th and early 20th centuries, it too was doomed.

The conservation movement in the United States has its roots in the late 19th and early 20th centuries; this movement coincided with the efforts to preserve Franconia Notch. Though many of the more famous campaigns to save landscapes were focused in the west -- to save the redwoods or to establish national parks like Yosemite and Yellowstone -- there were campaigns in other regions of the country as well. Movements in California, Minnesota, Wisconsin, Maine and New Jersey provided impetus, encouragement and models for a Franconia Notch plan.

The heart of the book centers on the campaign forged by the New Hampshire Federation of Women's Clubs (NHFWC) in association with other groups to save Franconia Notch from logging. Considerable attention is devoted to the evolution of the campaign to preserve the Old Man of the Mountain and Franconia Notch. The NHFWC, along with the Society for the Protection of New Hampshire Forests (SPNHF), and the Appalachian Mountain Club (AMC) formed the grassroots movement which drove the conservation movement in New Hampshire. Their regional and national connections enabled increased momentum for preservation of the 6000 acre tract owned by a hotel firm. These groups recognized that there was a strong likelihood that the land would be sold to a timber company. Jarvis carefully details the organization of a plan to raise funds in order to purchase the land by the state of New Hampshire, The Society for the Protection of New Hampshire Forests, and the New Hampshire Federation of Women's Clubs. The purchase was controversial in that many in the legislature regarded the price as excessive. Initially, the state pledged $200,000 of the agreed upon purchase price of $400,000. The remainder of the funds was to be raised privately. The SPNHF developed a plan to increase public awareness, and organize the fund raising, while the NHFWC actually secured most of the funds. Jarvis carefully describes the activities of the NHFWC efforts to educate, raise awareness and fund raise.

Jarvis outlines the hotel development in the late 19th and early 20th centuries in the White Mountains and Franconia Notch. She tells the story of the services provided in rather rustically elegant inns served first by stage coach, then by rail lines, and ultimately by roads. The wooden hotel structures were quite vulnerable to fire; Profile House, located approximately where the Cannon Mountain tramway is currently situated, was destroyed by fire in August of 1923, marking the beginning of the end of the lodging history there. The hotel owners at first decided to quickly rebuild the facility, but soon changed their minds. This allowed for negotiations for purchase of the property to begin.

The campaign for the preservation of Franconia Notch began in earnest in the autumn of 1927. The SPNHF wanted to preserve the Notch "in its noble, original form". Recognizing that

this landscape had appeal beyond the boundaries of New Hampshire, the campaign leadership extended the boundaries of the fund raising effort to Massachusetts and to the nation as a whole because of its perceived national importance.

The campaign turned to "wealthy businessmen, philanthropists, and ordinary citizens" for the remainder of the agreed upon purchase price. One successful aspect of the campaign involved an appeal to the public to "purchase" a tree for $1. One clever campaign tactic involved the use of a composite photograph which appeared in a Boston newspaper where the Old Man of the Mountain peered out over a Franconia Notch composed of stumps and fallen logs. The caption suggested what the Notch would look like if logging were permitted. The SPNHF and NHFWC fundraising was successful and the purchase of the 6000 acre tract was completed culminating in the transfer of the land to the state for a state park in 1928.

Franconia Notch and the Women Who Saved It is a remarkable contribution to the history of New England, the conservation movement, and to women's history. It is thorough, well written, nicely illustrated with photographs and maps, and extremely well documented with end notes and an extensive bibliography. It is appropriate for use in tourism, women's studies, women's history, and environmental studies courses, as an example of tourism development, the women's movement, and the evolution of the conservation ethic in the United States.

CREATING PORTLAND: HISTORY AND PLACE

In Northern New England

Joseph A. Conforti, ed.
Durham: University of New Hampshire Press, 2005. 388 pp.
ISBN: 978-1-58465-449-0

Reviewed by Mark T. Motte,
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Creating Portland represents a highly successful blending of the distant past and more recent historical geography of this most fascinating of Maine cities. The subtitle is *History and Place in Northern New England,* but the emphasis is primarily and unapologetically on concepts of "space." Massey and Meegan's (1985) phrase "The particularities of place" is especially apt here. The commission by the chief editor at Northeastern University Press was for this book to be about Portland as a "new England place," and not as a traditional history text. While broadly following an historical outline, the collection emphasizes the spatial reconfiguration and cultural geographical redefinition of space in the city. And it works very well indeed. Throughout the carefully drawn chapters, geography is not treated as a mere backdrop to events, but rather as a constellation of locational, physical and human cultural forces that propel the march of history in the city's shifting pattern of redevelopment.

Of Portland, *New England Monthly* raved in 1985, "Imagine a City too Good to be True." In general, Conforti's contributors suggest matters have improved still further. Acknowledging the explanatory power played by place, in a section of his introduction entitled, "Place: From Geography to Public Memory", Conforti writes, "Nature sets 'boundaries' to and creates 'possibilities' for human activity," and "Geography created the possibilities for a successful maritime economy." (p. xiii).

Superimposed on the physical geography, of course, is human activity, "a layered record of a people's history that is revealed in the built environment." The editor's hand is always present in the blending of the geographical and historical, marked perhaps by his ten-year stint as interdisciplinary program director of American and New England Studies at the University of Southern Maine. His is a solid and well-grounded take on the power of place-making in the promotion of livable cities.

Examples of this "blending" of the geographical and historical abound. After an abbreviated account of the city's morphological spread and growing cultural diversity, we read of Portland's role as a "contested frontier" (in Emerson Baker's chapter) in which John Smith, the founder of Jamestown, returned to England from his coastal mapping expedition so enamored of Maine that he wrote a book to promote its settlement. After the establishment of the royal grant establishing the Province of Maine in 1639, various colonists sparred for dominance over the

land on and around what would become Portland. And as the English settlements grew, the native populations faltered. In many parts of coastal Maine all that survived were the Indian place names.

Within Maine, of course, Portland is central to commercial life and has been since the 18th century. Charles Outwin's chapter entitled "Thriving and Elegant Town: Eighteenth-century Portland as Commercial Center" is particularly successful in laying the foundation for much of what follows in the book: sketching how the port of "Falmouth in Casco Bay," later Portland, rose to prominence because of its location and emergent seaport. Deep shipping channels, favorable alignment to prevailing winds, a convenient and safe harbor, and its role as a gateway to the northern frontier meant Boston merchants and traders took a growing interest. Because of Maine's harsh winter climate, the city became a valuable transshipment point: imported wheat was stored in the massive granaries and ground flour was sent down the coast and into the hinterland. As the 18th century slipped into the 19th, new, larger industries emerged. Shipbuilding, all forms of seaborne trade, a blossoming civic culture conferred what Outwin describes as Portland's "unique status as a boomtown." Despite the ebb and flow of fortunes so common in New England cities' mercantile and industrial evolution, Portland today ranks among America's top 25 ports, outstripping even Boston.

After James Leamon's insights into Portland's fortunes during the revolutionary war (Britain came down hard on its independent minded population) and Charles Calhoun's lyrical musings on the life of Henry Wadsworth Longfellow (a pleasant diversion from the book's major themes: "Is it changed or am I changed?/Ah! The oaks are fresh and green..."), we are exposed to broader discussions of the city's shifting cultural geography and its implications for successful place-making. A series of chapters deal with Latin American influences on Portland; the visual arts; literature; women, class and ethnicity; African-Americans; and the gay community. Some unique insights emerge from these chapters. In his discussion of Latin American influences in the 19th and 20th centuries, David Carey, Jr. reveals that Portland became one of the largest sugar and molasses ports in America because of its merchants' near monopoly of these commodities in Cuba in the 1850s and 1860s. Indeed, Carey cites the *Portland Board of Trade Journal* of this period as follows, "Portland had the largest trade with the West Indies of any port on the Atlantic coast."

But a century and a half later, Portland was no exception to the incipient racism that took hold after 9/11, with Hispanics feeling disproportionately impacted by the imposition of stricter Homeland Security regulations. Even Latino U.S. citizens and permanent residents were more prone to 'stop and search' actions by law enforcement officials. An especially delicious quote comes from a Puerto Rican woman who, when asked if she were an illegal alien, replied, "Honey, I've been American since the late nineteenth century."

In "Picturing Place: Portland and the Visual Arts" (Donna M. Cassidy) and "Writing Portland: Literature and the Production of Place" (Kent C. Ryden), we find chapters that, as well as any I have read on the topic of arts and urban place-making, articulate the role of artistic life in shaping a livable city. Cassidy painstakingly explains how the images conveyed by two-dimensional art shaped perceptions of the city and, as a consequence, its morphology: "Portland and its environs were mapped out according to... landscape categories" (p.132). Famous for its

landscape painting throughout the 19th and 20th centuries, Portland's artists created a tourism industry where visitors were invited to "consume the scenery" as the art works were "advertisements of a sort for the islands and coast in and around the city." The power of art in shaping the public's engagement in preserving the value of green space and unbroken vistas persists into the 21st century. In 2001, the 'Black Cove/Heart of Portland' project combined an examination of the aesthetic, historic and ecological factors that made the city "work" as a livable place. Cassidy also notes the dramatic influence of centuries' worth of public art in defining spaces throughout Portland.

We learn from Eileen Eagan, in "Women, Class and Ethnicity", about the strong influence western Irish immigrants, particularly the women, had on the city through the cultural capital they brought with them: traditions of sewing and dressmaking, high rates of literacy, the ability to speak English, a culture of "optimism and faith in their capacity to improve their lives" and the fostering of strong family bonds that enabled generational immigration from their home regions in Ireland. Their journey across the years was from "peasant maids to city women."

In "What They lack in Numbers: Locating Black Portland, 1870-1930," Maureen Elgersman Lee provides examples of the lives of several prominent black families in Portland and uses previously un-mined US Census and related data to analyze the decline and then growth of a highly heterogeneous black community in the post-bellum decades. Unlike the black settlement experience in most American cities during the first third of the 20th century, Portland's black population was drawn from all parts of the South, the Midwest, other New England cities, and the Caribbean colonies of Britain, France and Spain. However, like so many other New England cities, Portland has experienced entrenched, persistent patterns of spatial segregation by race.

In "Creating a 'Gay Mecca", Howard M. Solomon explains that Portland is not typical of the broader 'gay revolution' that started in America in the 1970s, but is different because its story is one of "changing conceptions of how a community imagines itself, and the myths it chooses to believe in." Long before other coastal states in the eastern U.S., Maine had been discovered by writers, artists and the Bohemian classes, and had, since the late 19th century, been marketed as the 'Playground of the Nation.' But true acceptance did not come easily. Pivotal in its success relative to many other cities, however, was the creation and sustenance of the Maine Gay and Lesbian Symposium ('The Symposium'), which attracted advocates from all over northern New England and nearby Canadian provinces for two decades. The early, post-Stonewall success of local openly gay artists, writers and other change agents is, in large measure, the result of an enduringly tolerant culture, the effectiveness and political savvy of advocacy organizations, and a generally open-minded political class. Today, according to Solomon, Portland, Maine is among the most gay-friendly cities in the US: "In creating an authentic community, lesbians and gay men have helped shape a new Portland" (p. 311).

So in its late-20th century revival, Portland played to its physical and human geographical assets. Natural deep water harbors, a port that had declined and whose warehouses and townhouses were ripe for the arrival of the creative class, a setting that had long been admired by artists and tourists alike, and the single largest agglomeration of commercial activity within the state. The city also benefits from a sterling history of entrepreneurship, an emphasis on sustainability and preservation of the built environment, a business climate that nurtures cultural capital, and

a sphere of commercial and cultural influence that ranges across a substantial territory, delimited only by the reach of Boston. In his epilogue, Conforti calls Portland's a "creative economy." It remains the destination of choice within its region for "lifestyle refugees."

Unlike so many books on New England cities (and there are many), this exceptionally well edited collection goes beyond the stereotypical potted history. As Conforti is at pains to point out in his introduction, "This volume is designed as a crossdisciplinary study of place rather than as a comprehensive local history" (p.xxviii). As such, its first-rate scholarship will be of interest to urban geographers, city planners, urban scholars in general and, perhaps of greater importance, those passionate about Portland. In particular, *Creating Portland* is highly recommended for those educators in New England studies who seek a deftly assembled collection of case studies for their teaching of the human and cultural geography of Maine's largest city.

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THE GEOGRAPHY OF WINE: HOW LANDSCAPES,

Cultures, Terroir, and the Weather Make a Good Drop

by Brian J. Sommers,
Plume of Penguin Group (USA) Inc., New York, 2008. 304 pp.
paper, ISBN: 978-0452288904.
[Also available as ebook, Adobe Digital Editions, 1.9 MB, 304 pp.
ISBN: 978-1436212588.]

Reviewed by Charles E. Button and D'Arcy Dornan,
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Brian J. Sommers is a Professor of Geography at Central Connecticut State University; he has taught a course on the geography of wine for many years. Sommers' goal is to help the reader become more aware of the geography that goes into the production of a bottle of wine, as in the book's subtitle '*How Landscapes, Cultures, Terroir, and the Weather Make a Good Drop*.' He also uses the book to demonstrate the broader context of the field of geography, i.e., more than just the memorization of places and mapmaking.

Sommers' approach is to provide information about the environmental and social science of viticulture, the growing of grapes and oenology, or wine production as they relate to the field of geography. His main reason for the writing of this book (it was originally proposed to the publisher as a textbook), is to provide an introduction to geographic principles that in turn provide for a greater understanding of wine. He states that "it is a good accompaniment to the other wine books you have on your shelves." The methodology used is that of a social scientist; he uses a thematic approach, taking into consideration "how climate, geology, biology, culture, politics and economics affect wine and how the geographies that relate to these factors have an impact on wine regions." Sommers has done an admirable job of writing a book that is informative and rooted in geographic principles and yet accessible and of interest to a general audience. He helps us, as a good geographer can, synthesize the various factors that go into making a place unique, in the sense of a viticultural or winemaking region.

Sommers guides the reader to better understand the geographical attributes, both physical and human, that lead to wine being grown and produced in particular regions and places in the world. A unique aspect of this particular book is the chapter on the use of geographic information systems (GIS) and its applications in the choosing of appropriate grape growing land parcels for vineyards.

Although the book could be used as a supplement for a course on the subject of wine (geographical or not), it is a pleasantly educational read for the wine connoisseur/enthusiast.

The book is structured so that the first seven chapters have heavier emphasis on the physical geography of grape growing and wine production, e.g., soils, climate, terroir, biogeography,

and natural hazards. Then he devotes two chapters which discuss the technical tools used in geography and their connection to grape growing and wine production. The remaining chapters link the human and cultural aspects of the geography of wine. He wraps the book up by sharing some personal reflections of wine places and experiences. The reader certainly does get to travel and tour vineyards around the world in this book, as promised.

Surprisingly, the book only has one map and just a handful of black and white photographs. A reader deciding to buy this book might very well be expecting more maps and photographs and the author, being a geographer, certainly would have done well by providing more. The website for the book promises to do more in this regard.

Sommers states that "there are no technical texts in the geography of wine that are comparable" and in that regard, this book holds an important place in the literature of its subject. He underlines the fact that understanding the concept of *terroir*, which is crucial in one's understanding of wines and the world of wine, is "a natural for geographers". Understanding grape production, wine making and wine producing regions is all about the relationships between humans and their environments, and this is what a geographer does best. This book should be a must read for anyone interested in the subject and definitely for anyone going into the industry.

THE VIEW FROM VERMONT: TOURISM AND THE MAKING OF an American Rural Landscape

by Blake Harrison,
University of Vermont Press, Burlington, VT, and University Press of New England, Hanover, NH and London, 2006. 344 pp. paper, ISBN: 978-1584655916

Reviewed by Lorri Krebs,
Department of Geography, Salem State College, Salem, MA.

This book is an interesting, well-researched and clearly written work that has applicability beyond its "View from Vermont". Indeed it is notably grounded in a New England context, yet the tourism insights and discussion may have relevance on a broader scale. Harrison suggests the book is used "to explore tourism's influence on landscape and identity" (p. 21) and in this regard the strengths lie in the historical account of the role of planning legislation in tourism development. The contributions of tourism in altering not only the natural landscape, but in the social and cultural discourses that took place during the last century are considered.

Many of the stories are told using the negotiation of landscape and identity in the context of work-leisure relations. Harrison challenges current assumptions and identities of natural rural landscape and offers a "middle ground" alternative as the transition area where "we negotiate our place in the middle world" (p. 16). Photographs and quotes provide a "snapshot" of a picturesque Vermont, while the narrative enlightens the reader on the conditions and decisions consciously made to sculpt the landscape for this desired outcome. We are invited to think critically about the relationships and identities that have been forming in Vermont since the nineteenth century and the subsequent shaping and "re-working" of the rural landscape.

At the onset, the reader is offered a variety of theories to frame the stories that follow, from Richard Schein's ideas on the role of cultural landscape, Mitchell's offering of landscapes deliberate 'masking' of social, economic, and political complexities to Urry's "Tourist Gaze". Subsequent chapters set the stage and continue the historical account. An introduction to a landscape designed by two types of work, agriculture and industry, is offered alongside a discussion of nostalgia and progress. The difficulties Vermonters faced during the 1930's as many farms failed and subsequently chose to abandon their land is well documented and sets the stage for the debate on the value of the summer home as a resettlement strategy. The stories found in these first few chapters do indeed call into question the role of the cultural landscape and offer "rural" almost as a contrived marketing ploy by the Vermont Bureau of Publicity and the Vermont Department of Conservation and Development.

Throughout the following chapters, the reader can't help but focus on the marketing of Vermont that would, in today's tourism development context, be considered targeting or

segmentation strategies. One such strategy seems to focus on blending the "wild" with the rural landscapes as the wilderness areas of the Green Mountains are described as "pure, timeless, peaceful, and uncontrived" (p. 115), yet "just as accessible to the visitor as the state's rural valleys"; transportation and accessibility being the basic tenets of shaping the ideal rural identity of Vermont in chapter three.

"Creating a new seasonal cycle" aptly subtitles the chapter which focuses on literature published in the early 1900's that contributed to the notion of Vermont being a year-round destination for tourists. Assisted by the development of the skiing niche, excitement is added to the offerings of "leisure-living communities". In the "Balancing the Rural" chapter, Harrison illustrates how these broadened tourism markets to four seasons and skiing "reinforced the sense among many rural landowners that property was far more valuable for leisure than for farming" and thus continued to further shape the rural landscape.

On the whole, this book is well documented with a variety of literature from relevant books, letters, and newspaper articles to an examination of State level policy and advertising strategies. The *View from Vermont* will certainly interest readers in the history of rural landscapes, work-leisure relationships, and human-environmental interaction.

TWO VERMONTS: GEOGRAPHIES AND IDENTITY, 1865-1910

Paul M. Searls,
Durham, NH: University of New Hampshire Press, 2006. 256 pp.
ISBN: 978-1584655602

Reviewed by Thomas A. Rumney,
Center for Earth and Environmental Science,
Plattsburgh State University,
Plattsburgh, NY.

The images and realities of landscapes and places from the past to the present have been topics of interest and study by geographers, historians, landscape architects, and many other versions of academics and scholars for a long time. So too has the conflicts of groups of people for those places, resources, and the hearts and minds of those who lived on and identified with such places. One such place that has experienced such a conflict of image, reality, practicality, and process has been Vermont. This conflict over Vermont's lands, people, and development seems to stem from its very origins as a settlement region and home for European settlers and developers, dating from the eighteenth century through the nineteenth century as Vermont steadily evolved from being a frontier society to a distinctive New England regional icon and homeland.

At the core of Searl's volume are two terms and concepts which he sees as identifying separate peoples, economies, and cultural landscapes. They are "downhill" and "uphill." These two labels not only identified very different groups of people who all too often were in vigorous conflict with each other to control Vermont's politics and everyday economic affairs. They also signified two very different views of the past and future of the state, and the very soul of Vermont.

Although numerous individual characteristics and individuals made up these two sides in an enduring struggle, each group and their respective members had several tendencies and commonalities. The "Uphillers" were primarily small-scale farmers, woodcutters, and common folk who coaxed and sweated a living out of the smallholdings of the hills and vales of the more rural and isolated areas of the state. Rarely commercially successful or financially wealthy, such people saw themselves as the preservers and practitioners of Vermont's traditional and pre-modern ways of life. With their long-standing control over the state legislature, Uphillers were often able to block or hamstring the modernizing tendencies of Downhillers. They were indifferent or hostile to industrialization, the development of railroads, commercial expansion, and the growth of higher education with the merger of a state agricultural college with the University of Vermont. They demanded localized control over their schools, as opposed to consolidation. They opposed, to varied degrees, immigration as a dilution of "True Vermonters," and were indifferent to the expansion and development of tourism and recreation industries in the state in the late nineteenth century. Considered obstructionists by Downhillers and hopelessly anti-modern, they struggled to keep their ways of life and to keep their children home.

Downhillers usually lived in the towns and cities of Vermont, and most often were involved in commerce, artisan professions, and industry. They also were described as "modernists," and wanted in various ways to develop, using capitalist and vigorous means Vermont's resources, lands, and people. They also were usually receptive of and welcoming to newcomers from other American regions and foreign lands. They also initiated programs to bring into Vermont immigrants as workers in budding manufacturing, quarrying, and transportation businesses. These included Irish, Swedish, French-Canadians, and others. These efforts to bring to Vermont "New Vermonters" met with indifferent success, as did efforts to keep young Vermonters at home, as opposed to migrating to other parts of the country. Ironically, the Uphillers and Downhillers agreed that the loss of younger Vermonters to emigration was something to resist, yet even here the two sides could never agree on methods to keep Vermonters in Vermont or even why they should do so.

A telling point of difference between the two groups was their conflicting opinions about who was a Vermonter. To non-Vermonters, such a question might seem odd, even irrelevant, but this became a recurrent issued throughout the nineteenth and into the twentieth centuries. The common Uphiller vision was for one needing to be born in Vermont, and of a long-resident Vermont family. Downhillers were more willing to grant a "Vermont-ness" to people who were perceived leaders, developers, and benefactors of a modernizing and "improving" Vermont. In this often unpleasant and shrill disagreement, some rather important and affluent personalities both added to the development and change of Vermont, but also suffered political and social losses and less than total success. This was never a resolved question, with both immigrants and emigrants experiencing varied levels of acceptance, avoidance, and success that in turn influenced whether or not they remained in Vermont.

Searls has provided a thorough, well-supported and documented, and interesting study of life, culture, and events in nineteenth-century Vermont. This book is well-written, logically organized, and lively. Yet, for geographers the title at least might be a bit misleading. This is not a "geographical" study of nineteenth-century Vermont, but is a geographical history about much of the social and cultural aspects of the state. There are no maps typical of a regional geographic study; in fact, there are no graphics at all. At least a place-location map or two would have given readers who were unfamiliar with the towns and places of Vermont a helping hand, without the necessity of an atlas or road map. Other maps on industries, population patterns and developing transportation systems would have helped the reader to more clearly envision the cogent prose that Searls offers. So too would have some relevant photographs, though cost issues might have decided such. There also was no attempt to measure the numbers, locations, and various impacts of Uphillers and Downhillers, except to roughly assemble each in rural versus town and city settings. But, were such arrangements of these two groupings that totally separate? And, were all Downhillers completely Downhill, and all Uphillers with only one set of characteristics. It is probable that such a measurement is truly impossible, given the nature of these differing groups, and that this question comes mostly from the curiosity of this reader.

What this book accomplishes has many elements. It brings to readers an understanding of an iconic region on the "West Coast of New England" about the travail and angst of the traditional versus the modernizing of American peoples and places during the nineteenth century. One

suspects this conflict has not really ended in Vermont, and elsewhere, in the United States to this day. This study also adds much to an understanding of the special cultural and social development of Vermont. It also can provide a starting point for further studies on the geographical, historical, political, and cultural changes and evolution of Vermont. Although it is not strictly "geography" (as a discipline of study), it is very much a useful and thoughtful springboard for further studies. Plus, it simply is a good read.

Abstracts

2007 Annual Meeting of NESTVAL

November 2-4, 2007, New Haven, CT

Michael Adams, Jessica Lee and Alan Solitar,
New York City Lab School

Wind Resources and Utilization of the Northeastern US

Where are there windfarms in the Northeastern US? How much are we currently generating and what projects are in development? This will be a geographic look at what states are producing wind power, with looks at legislative differences to differences in wind resources.
Keywords: energy, renewable, wind, electric

Note: This will be a poster presentation

Rodrigo Alves Capelani,
Department of Geography, Bridgewater State College/UFRGS

New urbanization, new segregations in the Metropolitan Area of Porto Alegre in Brazil

The Metropolitan Area of Porto Alegre (MAPA), which is located in the south of Brazil, has undergone a rapid urbanization process in recent years. This has brought about a new sense for the usage of the urban space from different social groups. Typically, public politics focused on central districts in the town, while transformation of the suburbs - with little or no infrastructure - created living places for lower income groups. The gated communities represent a new style of living in MAPA. They express a way for the elites to protect and isolate themselves from the poverty of the "underdeveloped" suburbs and from the pollution and congestion of the city center. The developers look for the farthest areas which have both infrastructure and access to the amenities valued by the elite. The most recent Gated Communities emphasize the necessity of living next to green areas, saving part of these areas for tree planting and/or preservation of some jungle, which is there already. "Living safety with nature" captures the developers' way of satisfying the imagination of their consumers. These new communities have a market with resources that represent a great attraction for real estate capital. This presentation looks at these enterprises, how and where such space is found, the ways in which the developers attract the preferred buyers, and how these enterprises are expressing the new way of life in towns throughout the region that contribute to increasing segregation and fragmentarion.
Keywords: Brazil, urbanization, change, segregation, poverty

Carol Atkinson-Palombo,
Department of Geography, University of Connecticut

Using the Peer Review Method in Urban Studies Writing Courses

I will share my experience of using peer review in an urban studies writing course to encourage students to learn how to give and receive feedback and strengthen their writing skills.
Keywords: Learner-centered education, active pedagogy, urban geography, critical thinking

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Richard Benfield,
Geography Department, Central Connecticut State University

The Geography of Flowers; Local, Regional and Global

Flowers have a significant place in our contemporary world romantically, esthetically, economically and now geographically. Originally produced by small local producers for local markets, flowers today are a $ 700 billion industry and marked by production and distribution on a global scale. This paper will examine and illustrate the geographic patterns of flower production and consumption at the local, regional and global scales, from local nursery purchases in Connecticut to Aalsmeer wholesale market, Netherlands, that sells 19 million blooms per day for distribution around the world thus suggesting that flowers are another, but overlooked, feature of an increasingly globalized world. *Keywords: production, consumption, scales, globalization*

Patricia J. Beyer,
Department of Geography & Geosciences, Bloomsburg University of Pennsylvania

Return to the River: Using Environmental History to Improve the Relationship between Humans and Nature

This paper presents an environmental history of lower Fishing Creek, Columbia County, PA, as means of increasing environmental awareness in an area where residents and officials tends to view nature as hostile and destructive. The town of Bloomsburg has created a hiking/biking trail along the creek, passing through an area with a complex history of resource use. Modern conflicts over flood control overshadow the long history of benefits associated with this natural resource. I suggest that presenting this environmental history to the general public through an interpretative trail will help improve perception of this valuable resource.
Keywords: environmental history, water resources

Samuel Blanchard, Nick Bumbarger, Alina Taus and Joe Fortier,
Department of Geography, Clark University

Integrating Remotely Sensed Data and Environmental Variables to Map Forest Cover Types in Massachusetts

The purpose of this poster is to present the results of a statewide land-cover mapping effort (circa 2000) of Massachusetts. The methods presented here identify best practices for atmospheric and geometric preprocessing, data integration, and classification techniques determined through pilot study research, for regional mapping programs. These practices were developed to be generalized across landscapes for other regional mapping studies. Five multi-seasonal Landsat ETM+ scenes, in combination with environmental variables, were individually classified and mosaiced to produce a seamless land-cover map for the State of Massachusetts with an overall kappa index of agreement (KIA) of 0.82. *Keywords: Remote sensing, forest monitoring, multi-seasonal spectral data, ancillary data*

Note: This will be a poster presentation

CJ Bright,
Geography- Regional Planning and Development, Salem State College

Boston's Silver Line BRT: Rapid Transit or Glorified Bus Line?

Figuring out the best way to solve a transportation problem is never easy, trying to solve this in a very old city provides unique problems that are not found in younger cities. Boston's answer to its current transportation crisis is not using rail transit, but a reinvention of an old mode, using buses to move people around. Bus rapid transit is supposed to be able to provide rail like service. The question is whether the bus rapid transit line lives up to its billing as equal or better service to the old elevated line that it eventually replaced. *Keywords: Boston, BRT*

Thomas X. Brodnitzki,
Department of Geography, Central Connecticut State University

The Growth of Active Adult Age-Restricted Retirement Communities in Connecticut

The traditional definition of retirement and retirement migration is changing in the United States. This change in retirement is being fueled by the baby boomer generation. The retirement market is set to explode as this cohort of over 75 million Americans prepares to retire in the coming years. Traditional retirement migration has led retirees to move to warmer destinations to live out their remaining years. However, this trend, spurred on baby boomers' desire to do things differently from previous generations, is changing as new, local retirement migration des-

tinations are being built to suit the needs on new-age retirees. This thesis examines the growth of active adult age-restricted retirement communities in the state of Connecticut, a non-traditional retirement destination. Connecticut's population has a higher percentage of baby boomers than the national figure (31.4% - CT and 29.7% - US). In addition to this statistic, Connecticut also illustrates migration data that indicates that is has a sedentary population that does not move very far. These figures offer the potential for a rise in the development of a new retirement alternative. Connecticut has seen a recent surge in the development of active adult age-restricted retirement communities. Towns around the state must now consider if the development of these new communities is a positive economic development option, or if other negative factors outweigh the positive. This thesis overviews Rocky Hill, Connecticut, a community which is currently going through this debate. Rocky Hill has seen eight such communities built in recent years and has illustrated conclusions through revisions to the Planning and Zoning Regulations that their community may be saturated with this type of development. Other towns around the state and in the region can look to the example of Rocky Hill, CT to determine if they wish to promote the development of active adult age-restricted retirement communities.
Keywords: Connecticut, adult communities, growth, baby boomers

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Carol Brutza,
Humanities Department, Gateway Community College (New Haven)

Changing Ethnicities in the Fair Haven Community of New Haven

New Haven has a long history of new immigrants moving to different neighborhoods and affecting great changes to the urban landscape. This paper gives a historical perspective of how immigrants have settled and then shifted spatially around the city. The Fair Haven neighborhood will be especially targeted as an example of how it has impacted the current landscape of this area. *Keywords: ethnicity, changes, community*

Charles E. Button,
Geography Department, Central Connecticut State University

Using Stream Channel and Riparian Zone Attributes to Assess the Physical Integrity of Rivers and Streams

Human activities have had a profoundly negative impact on the water quality of the flowing streams and rivers of the world. In the United States, the Water Pollution Control Act of 1972 (PL 92-500) established a goal to "restore and maintain the physical, chemical, and biological integrity of the nation's waters." Since then, most of the science and methods employed to assess the quality of flowing waters has focused on chemical and biological aspects of water quality. An assessment system is proposed here that uses stream channel and riparian zone attributes to

evaluate the quality of the physical integrity of numerous stream and river reaches within the Farmington River watershed. This study has resulted in the initial development of the Index of Physical Integrity, a multi-metric model that can be used to assist in the assessment of the vitality of overall stream/river health. *Keywords: water*

Brian M. Cacchiotti,
Department of Geography, Salem State College,

Wind Power in Minnesota: The Variability of 10-Minute Wind Power at a Tall Tower in SW Minnesota

Wind energy is quickly emerging as a viable alternative to non-renewable energy sources. Minnesota is among the national leaders in promoting wind power and development. I will speak about wind power in Minnesota and discuss specifically 10-minute variability in a high frequency wind power dataset published by the Minnesota Department of Commerce.
Keywords: wind, climate, energy

Jean Cermakian,
Département des sciences humaines, Section de géographie (Université du Québec à Trois-Rivières)

The Geopolitics of Showdown in Lebanon: an Imperiled Multicultural Society

Lebanon is a victim of its geography, history and of Middle Eastern politics. The latter exert upon Lebanon a series of contradictory and antagonistic pressures. On one hand, Saudi Arabia and the Persian Gulf Emirates back the government elected in 2005; on the other, Syria and Iran back the opposition led by the Hizbullah party. The situation is complicated because the struggling Lebanese democracy is a hostage in the conflict between the West (U.S. and France) and the Damascus-Teheran axis. The complexity of Lebanese geopolitics can only be understood by assessing the situation on three scales: national, regional, and worldwide.
Keywords: Lebanon, geopolitics, conflict, scales

David Correia,
Department of Social Sciences and Business, University of Maine at Farmington

The Forest Regime in Maine: Certification and Regulation

This paper provides a preliminary analysis of the first stage of a multi-stage project providing a quantitative comparison of forest certification programs in Maine. The study used USDA Forest Service Forest Inventory Analysis (FIA) data to compare the conservation outcomes of various forest certification programs. The purpose of the study is to identify the possibilities and

effectiveness of various forest certification regimes to embed environmental conservation values in the forest products industry. *Keywords: Forest certification, Maine*

Robert G. Cromley and Dean M. Hanink,
Department of Geography, University of Connecticut

A Multi-objective Model for Simulating Co-Location Economies

A multi-objective model is developed and applied to cases in which external economies arise due to co-location alone and also cases in which external economies arise due to city-size. The model simulates a gaming approach to solving the co-location problem. Nash points and Pareto efficient points are identified but rarely coincide in the locational patterns derived in the model. *Keywords: multi-objective model, economies, location*

M.S. DeVivo,
Grand Rapids Community College, Grand Rapids, Michigan

Maize, Migration, and Landscape Change in Southern Mexico

At the end of the 20th century, the indigenous people of southern Mexico experienced two significant events that would have far reaching ramifications resulting in landscape change: in 1989 coffee prices fell on the international market and five years later the North American Free Trade Agreement (NAFTA) came into effect. Heretofore, in many ways, the Maya and other indigenous groups maintained their traditional ways of life, as evidenced by their practice of milpa agriculture. Moreover, not Spanish, but Amerindian tongues continued to be chosen as the principal means of communication among numerous village dwellers of Chiapas and Oaxaca who engaged in the traditional form of farming they had been practicing for centuries. With the implementation of NAFTA, globalization picked up pace and proved to be a mixed blessing as many found themselves dispossessed of their lands and compelled to migrate to cities throughout Mexico and the U.S. in search of work. Rapid acculturation was one significant end result, the consequences of which have been previously not fully explored. In view of that, this work intends to address the impact of globalization among southern Mexico's indigenous people. *Keywords: Mexico, NAFTA, milpa, globalization*

D'Arcy Dornan,
Department of Geography, Central Connecticut State University

The Changing Nature of Tourism and Hospitality Studies: a Geography Department-Based Approach to Program Planning, Development, and Management

The case study of Central Connecticut State University's Tourism and Hospitality Studies pro-

gram, which is administered out of a geography department, will be used to highlight the new opportunities and changing nature of such programs in New England. The myriad employment opportunities available to students along with careful and consistent program planning, development and management can lead to successful programs. This particular program's growth is indicative of this approach. Other New England tourism, hospitality and geography programs will be examined to bring to light other patterns relevant to our ability to meet the needs and challenges of the industry and of academia in our quest for growth and sustainable/responsible development. This is where we, as geographers can make a cutting edge difference and crucial contribution. *Keywords: tourism, hospitality, geography, New England*

Lesley-Ann L. Dupigny-Giroux,
Department of Geography, University of Vermont

Using Service-Learning to Enhance Student Learning in the Atmospheric and Geospatial Sciences

Service-Learning is a reciprocal relationship among students, faculty and an external community collaborator(s), that is responsive to the needs of the collaborator(s), while enhancing student learning. The relationship is symbiotic such that all parties benefit by learning from each other. Service-Learning differs from volunteerism and co-curricular activities. Service-learning activities are directly related to curricular goals, with course assignments tied to the service experiences. In this presentation, I shall outline the ways in which the inclusion of this pedagogy in all of my climatology and remote sensing classes, has led to improved critical thinking skills and content acquisition by students at all levels of the curriculum.
Keywords: education; climatology; service-learning

Paul A Fernald,
Geography Department, University of Connecticut

Confluence of Asian American Settlement and Asian American Businesses in New England 1980 - 2002

The paper reviews the settlement patterns of Asian Americans in New England from the 1980, 1990, and 2000 Censuses. The rapid growth of this population has been surpassed by the growth in Asian American owned businesses. The population growth and business growth are explored as the diversity of the community in both ethnicity and business sectors increases throughout New England. *Keywords: Asian American settlement, Asian American owned businesses, Asian Americans in New England*

John W. Frazier,
Binghamton University, New York (Note: Keynote Speaker)

Race, Ethnicity, and Changing American Places: Some Examples From the Eastern United States

Since 1965, immigration and internal migration have reshaped many American places. Only recently have we begun to realize the magnitude of some these changes and the underlying processes that generate them. All major racial/ethnic groups are playing a role in the transformation of rural and urban places across the nation. This presentation provides several examples of changing places in the Eastern United States and provides a context for these changes. Latino, African, and Afro-Caribbean ethnic groups are used to visualize and discuss changing places. The processes leading to some of the changes in spatial patterns, cultural landscapes, and group adjustments also are discussed. *Keywords: Immigration, internal migration, race, ethnicity*

Laurence Goss,
Department of Geography, Salem State College

Gamma Theta Upsilon Chapter Activities in the NESTVAL Region

This session will review the results of the recently completed survey of Gamma Theta Upsilon chapter activities in the NESTVAL region conducted by Dr. Christopher Cusack of Keene State College. Discussion will follow as to how to increase and better coordinate GTU activities within the NESTVAL region at both existing chapters and the possible addition of new chapters. *Keywords: GTU, New England, survey results*

John T. Hayes,
Department of Geography, Salem State College

Natural Resource Management in a Geography Curriculum

Issues related to the exploitation, conservation, preservation, and management of natural resources are researched and taught by many academic geographers in geography programs across the United States and Canada. Management of our nation's forest, grassland, soil, water, and atmospheric resources, to name just a few, are well-suited to Geography's focus on the human-environment theme. The applied nature of natural resource management which bridges the social science content and the physical/environmental content of our discipline is also well-suited to what geographers teach and research. Because resource management careers fully exploit the spatial technologies of GIS, GPS-based mapping, remote sensing, and digital image processing, there are many opportunities for our students to procure employment after they graduate with a major in geography. Geographers can work for all levels of government from local to state to federal agencies with resource management responsibilities. This paper will explore Salem State's

efforts to develop a concentration in "Natural Resource Management" for our B.S. Geography majors and will discuss some of the lessons that we have learned and what our plans are for the future in terms of our curriculum development. Natural resource management curricula in selected other college/university settings will also be discussed. *Keywords: natural resource management, resource geography, geography curriculum, applied geography.*

Patrick Heidkamp,
Department of Geography, Southern Connecticut State University

Enriching and Engaging the Learner in World Regional GeographyThrough Innovative Instructional Methods

World Regional Geography attempts to illuminate and highlight the different realms of the world, through the study of geographic relationships among natural and cultural environments. The course can be filled with a myriad of facts and figures that can, at times, be rather bland and dry, especially if a 'canned' textbook/course approach is used to deliver the material. Thus, holding the attention of the students can become a significant issue. The objective of my contribution to this panel is to: (1) discuss a means by which contemporary issues can be effectively included in the course material without neglecting the overall objective of the course; (2) discuss a way to present course material in a more efficient and engaging manner; and (3) discuss how teaching assessment methods can be used to better connect to the students and as a result, increase overall learner motivation and retention.
Keywords: World regional geography, education, motivation, retention

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Katie Himmelfarb,
Department: Edward J. Bloustein School of Planning and Public Policy, Rutgers University

Loft Conversion and Neighborhood Change in the Post-Industrial City: a New York City Example

The conversion of industrial lofts from places of manufacturing to residential spaces for artists and other, more affluent, inhabitants brings together many of the social, economic and physical transformations that characterize the post-industrial city. Williamsburg, Brooklyn is an example of a place that has undergone this transition from industrial prosperity to post-industrial decline and eventual redevelopment and gentrification. In this paper, Williamsburg is used as a case study to examine the way that many salient urban issues manifest themselves in loft-conversion neighborhoods and to highlight some of the policy and planning challenges that these transitions entail. *Keywords: gentrification, loft conversion, Williamsburg, Brooklyn*

John G. Hintz,
Department of Geography & Geosciences, Bloomsburg University of Pennsylvania

No Nature, No Injustice: How the Nuclear Industry Found a New Home in New Mexico

In August of 2006, Louisiana Energy Services (LES) broke ground on the first privately owned uranium enrichment facility in the United States. After a decade-long fight in three US states in which two prior LES enrichment facility siting efforts failed, the New Mexico siting process represents a victory for industrial interests over the challenges of environmental justice activists. In this paper, aided by the recent critical literature on environmental justice, I examine the implications of this industry victory for the environmental justice movement.
Keywords: environmental justice, nuclear energy

Darryl Hugley,
Urban Studies program, Southern Connecticut State University

The State of Black Nationalists Movements in Urban America

During the 1960s some African Americans became increasingly frustrated by the government's lack of responsiveness to problems such as unemployment, overcrowded housing, and police brutality. As a result, they formulated and organized radical ways of effecting political and social change. The large scale effort for this became known, overall as the Black Power Movement. Within this movement emerged clandestine insurgent military forces. Although they've always been a part of the black freedom struggle, these forces began to emerge in urban spaces across the country. Groups of greater and lesser known prominence emerged in places like Louisiana with the Deacons for Defense and Justice, Missouri was home to The Black Liberators, Alabama gave birth to The Defenders, Michigan experienced The League of Revolutionary Black Workers, while Mississippi gained the Provisional Government of the Republic of New Africa (RNA). California would see the rise of the Black Panther Party (BPP), the United Slaves (US), and the Sons of Watts Improvement Association (SWIA). New York City would experience a loosely organized non hierarchal group known as the Black Liberation Army (BLA). Forerunners of these groups include the African Blood Brothers (ABB), and the Revolutionary Action Movement (RAM). This papers provides an intriguing study of the of the state of the most influential, yet overlooked black nationalist organizations to have existed in urban America during one its most incredible periods.
Keywords: African Americans, Black Power movements, urban America

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Lorri Krebs,
Department of Geography, Salem State College

Team-based Learning

Trying to engage students in course content is often difficult in certain classes, and creating discussions even a greater challenge. Structuring a course to utilize a team-based approach to learning can be the answer professors are looking for. There are many benefits to this type of active learning and specific goals that can be reached will be discussed, such as: a comprehensive understanding of course content; application of course content to problem solving and decision-making; development of skills for working effectively on a team (in a team environment); and understanding and valuing team approach to solving complex intellectual tasks.
Keywords: Team-based learning, active learning

Peter A Kyem,
Department of Geography, Central Connecticut State University

Is Wireless Communication Technology a Panacea to the Economic Development Stalemate in African Countries such as Ghana?

There is a considerable debate about whether wireless communication technology is the escalator that can bring economic development to African countries such as Ghana. Unlike earlier instruments of development whose influences were limited to urban enclaves, the beneficial impacts of technologies such as mobile phones reach anywhere without an expensive landline or road infrastructure. Foreign capital is also available for wireless networks while revenues from such investments are often re-invested. Accordingly, subscription to mobile phones is bound to continue in Ghana but the main questions are: *Is wireless technology a panacea for economic development impasse in Ghana? What potentials do mobile phones hold for economic development in Ghana?*
These questions form the basis of discussion in this paper. The paper explores the link between mobile phones and economic development in Ghana and concludes with suggestions for strengthening socio-economic development through the use of mobile phones.
Keywords: Mobile phones, wireless communication technology, economic development, Ghana.

Elisabeth Levac and Vanessa Stretch,
Department: Environmental Studies and Geography, Bishop's University

Influence of Spring-Summer Weather on the Start and Duration of Pollination Season and on the Timing of Pollen Production Peak in Lennoxville, Quebec.

Airborne pollen and spores concentrations were monitored daily in Lennoxville borough (city of Sherbrooke, Qc) during the 2006-2007 summer seasons using a Burkard volumetric trap. The goal of this ongoing project is to determine how spring weather influences the start and duration

of tree pollination in the spring and the ragweed pollination in late summer/fall seasons. Another goal is to understand how weather conditions affect pollen concentrations in the air over a 24 hour period and improve our daily forecasts (http://ubishops.ca/pollen/). Results from the first two monitoring and forecasting seasons will be presented.
Keywords: Pollen, allergies, weather, Lennoxville

Crista M. Livecchi,
Department of Geography and Planning, University at Albany

Priest, Parish, City: Father Peter Havermans and Troy, New York

The church's influence on the shape of industrial American cities has largely been neglected in the geographic literature. Nineteenth century Troy, New York provides one example in which a religious figure—Father Peter Havermans, a socially active Catholic priest—played an important role in urban development. His impact on Troy through the establishment of new institutions demonstrates the potential effect an individual agent may have on a city from outside the structures that normally regulate urban design. Through an examination of Havermans' work, this paper explores an under-studied city and demonstrates the complexities of structure-agency interactions. *Keywords: nineteenth century cities, structure-agency interactions, urban design*

Marcos Luna,
Department of Geography, Salem State College

Exploring Environmental Equity through the Production and Consumption of Electricity in Massachusetts

Environmental justice research typically focuses on the inequitable distribution of the burdens of pollution, noxious development, and resource depletion. A central tenet of environmental justice arguments is the idea that those who bear the brunt of the costs of production are not the main beneficiaries of that production. However, little attention has been given to empirically exploring the relative distribution of both the costs and benefits of production. I will present results from a preliminary analysis of electricity generation and consumption in Massachusetts to examine the place of consumption in questions of distributional equity and environmental justice research more generally. *Keywords: energy, environmental justice, GIS, Massachusetts*

Daniel Mallmann Vallerius,
Department of Geography, Central Connecticut State University/UFRGS,
Fernando Dreissig de Moraes,
Geography at UFRGS

Brazilian Cyberspace Access to the Internet, Network Commerce and Public Policies of Digital Inclusion

Since the development of the so-called information era, especially since the 1990's, there has been a growing use of the Internet – a virtual means – in economic, social and information relations. Cyberspace is a concept that emerges in this context, and can be considered an extension of the geographical space based on a technical network comprised of the relationship between society in network and artificial nature. Opposed to that phenomenon that allows better communication, a new form of exclusion arises, characterized by inaccessibility to access means to the Internet. The present article aims at analyzing access to the Internet within the Brazilian territory. To do so, we intend to demonstrate regional inequalities regarding access to the Brazilian cyberspace; it is also important to analyze increase in electronic commerce. To perform this research, we used bibliographic references about the origin and genesis of the Internet, as well as about the concept of cyberspace. Later, we analyzed the data from PNAD 2005 [Brazilian Survey per Home Sampling], whose survey provided us with subsidies to develop two theme maps. We also tried to illustrate it with some cases of municipal public policies that aimed at incrementing access to the Internet. The results revealed the existing unbalance as to network accessibility, since a significant part of the population has never used a computer or the Internet. In spite of these little significant data, there has been a progressive increase in the population that has possibility of access. Within the Brazilian territory, there is a higher concentration of access points in the South and Southeast regions. With regard to electronic commerce, there is a significant increase in this type of sale. Finally, we consider that, despite the growth presented over the past years, access to the Internet is still very limited; therefore, it is necessary to increase the investment in initiatives that allow inclusion within this process.
Keywords: Brazil, Internet, access, regional inequalities

Stephen Matchak,
Department: Geography, Salem State College

World Regions Meets Online Learning

Online instruction and INTERNET resources have created new possibilities for teaching geography. In fact, the digital age requires the application of new approaches and material. This presentation focuses on the use of selected web resources to facilitate short research projects as well as geographic awareness. *Keywords: Geographic education, world regions*

Matt McCourt,
Department of Social Sciences and Business, University of Maine Farmington

"Pristine Wilderness" and/or a "Bought Vacation Spot": Analyzing Regional Landscape Values in the Context of Rural Restructuring

Over the past ten years ten million acres of Maine's private forestland have been bought and sold, in some cases two or three times over, as pulp and paper companies cashed out of their land holdings to be replaced by private equity investment firms, timber investment management organizations, conservation interests, liquidation harvesters, and kingdom owners. In addition to rapid changes in ownership, a series of citizens initiatives and large-scale development proposals have introduced uncertainty into Maine's forested landscapes and forest-based communities. In response to this fragmentation and uncertainty, a number of regions—including the Moosehead and Mahoosuc regions—have launched community mapping projects in efforts to take stock of their assets, to determine what's most important from the point of view of forest users, and to begin a broad-based conversation about how to plan for the future. This paper draws on the preliminary phase of one such community mapping project, based in the Rangeley-High Peaks region of western Maine, during which students in two upper-level geography interviewed over 350 project participants, gathering and then digitizing annotated sketch maps. In the paper we focus on the conflicting accounts of rural restructuring provided by sketch map participants in order to map the challenges and opportunities for resource management in western Maine. *Keywords: Rural, resource management, community GIS, Maine*

Stewart McHenry,
Norwich University

Origins, Development and Diffusion of Turkish Food

Present day Turkish dietary customs are the sum of four different factors. These are environmental influences, such as originating from a steppe environment. Early cultural preferences for certain dietary components and techniques such as milk products and grilling are another factor. With the expansion of the Seljuk and Ottoman Empire there began a selective introduction of new foods into their cuisine as a result of this movement to the southwest. Ottoman palace innovations and experimentation transformed what was a very heterogeneous diet into a very sophisticated culinary experience that diffused throughout Anatolia, the Ottoman Empire and many neighboring countries. *Keywords: Turkey, diffusion, food*

Akihiko Michimi and William H. Berentsen,
Department of Geography, University of Connecticut

Small Business Establishment Profile in Rapidly Growing U.S. Sunbelt Metropolitan Areas: 1995-2005

The study investigates links between rapid population growth in the Sunbelt's metropolitan areas (MSAs) and small business establishments (SBE). SBEs are generally associated with generating faster employment growth in a variety of industries and may be cause and/or effect of population growth in MSAs. Using data from 2000 Census Metro Business Patterns, relative concentrations of SBEs by economic sector in the rapidly growing Sunbelt's MSAs are identified. The size of MSAs appears to be an important factor in supporting concentrations of higher- and/or lower-order activities in larger and smaller MSAs, as proposed by the basic principles of Central Place Theory.
Keywords: small business sectors, rapidly growing Sunbelt MSAs

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Seila Mosquera-Bruno,
Director NeighborWorks New Horizons, New Haven

Changing Urban Landscapes: The Fair Haven Neighborhood of New Haven, Connecticut

Mutual Housing Association has been actively involved in the Greater New Haven area since 1991. Its primary goal, "Making a Difference One Block at a Time," is so clearly stated in this year's annual report. Today's paper focuses on exactly how this organization has created dynamic housing communities in the Fair Haven neighborhood. It looks at the current status of this neighborhood and how organizations like NeighborWorks have responded to the changes in population and economies in this specific area. *Keywords: housing, changes, neighborhoods*

Magda Natal,
Homeownership Educator, Mutual Housing/NeighborWorks, New Haven, Connecticut

Mi Cometa Project, Ecuador/USA

Greater New Haven's Mutual Housing Association's partnership with the non-profit Ecuadorian developer **Mi Cometa** began as a collaboration between NeighborWorks America and Harvard University's John F. Kennedy School of Government. This ongoing partnership has provided an organized view of comparative international experiences and best practices related to urbanization, urban development and poverty reduction. This paper focuses on the shared organizational exchanges, laying the groundwork for an international approach to community building.
Keywords: Ecuador, housing, international cooperation, community associations

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Mirela Newman,
Department of Geography and Urban Studies, Southern Connecticut State University

Urban Fieldtrips and Systematic Field Reconnaissance: Highly Effective Teaching Methods in Urban Studies Courses

In her famous book "The Death and Life of Great American Cities" Jane Jacobs stated that "cities are immense laboratories of trial and error," urging both urban scholars and practitioners to go in the field and learn from the urban reality as is on the ground. In teaching urban studies courses, I have used urban fieldtrips and systematic field reconnaissance as highly effective teaching methods that yielded great results. While organizing local urban fieldtrips can be challenging logistically and time wise, urban fieldtrips clearly help achieving course goals as they present several key advantages: (1) connecting urban theory and concepts with the urban reality on the ground; (2) fostering field observations, identification and examination of elements of the urban fabric; (3) enabling students to better understand and critically think about urban functions and issues; d) offering students the opportunity to learn more about their local towns and cities; e) "using" towns and cities as "urban laboratories" that stimulate understanding and exploration of urban issues; f) facilitating active student learning and direct involvement; e) helping to establish a strong team work and communication amongst students and between the professor and the students. During our round table discussion I will share several handouts illustrating key ingredients that proved to be highly effective in teaching urban courses via using the fieldtrip method: fieldtrip goals, structure and methods; specific tasks assigned to students both before and during the fieldtrips; and recommended books/readings. *Keywords: urban fieldtrips, systematic field reconnaissance, effective teaching methods, urban studies courses*

Judy Otto,
Department of Geography, Framingham State College

A Tale of Two Cities: Place Promotion in Urban Tourism Contexts

The centrally-planned 'new town' of Nowa Huta, Poland, Soviet-financed and -built for Poland's largest steelworks and its workers in the 1950s, was a tourist attraction from the beginning, drawing architects and planners to see how the tenets of socialist planning could be given architectural form. After the fall of communism, however, Nowa Huta suffered massive unemployment, lack of investment, and a tarnished image due to its associations with the repudiated communist regime. Despite the efforts of local entrepreneurs at rebuilding Nowa Huta's reputation by organizing "adventure-style" tours for Western visitors eager to see beyond the mass-market tourism of nearby Krakow's Old Town, Krakow has eclipsed it with a multi-pronged development strategy of attracting foreign investment, creating jobs, and solidifying Krakow's role as the symbol of Poland's 'Golden Age.' Using promotional materials, planning documents, and tourism brochures and guidebooks, I explore the discourses of economic development in the two places. I analyze how new narratives about the communist past and the capitalist future are

being built and shaped against the backdrop of a Soviet-style landscape. These strategies of post-socialism offer important lessons for the old industrial cities of our region: how can the "difficult history" of industrial pollution, the dominance of the heavy industrial sector, and the legacy of totalitarian rule be rewritten to serve new aims. *Keywords: Poland, tourism, post-socialism*

James S. Peters and Richard W. Wilkie,
Departments of Natural Resources Conservation, Geosciences, University of Massachusetts, Amherst

Geographic Knowledge and Spatial Representation Project

The paper reports on a project to develop a curriculum to integrate GIS education with the intellectual core of geography. GIS courses are taught in a wide range of academic disciplines. However, no consensus exists on a coherent pedagogic framework for GIS education. One result is that GIS students become proficient in the operation of GIS software without developing proficiency in geographic thought. Beginning with a short literature review, the paper describes a proposed pre-GIS curriculum, lists the key geographic concepts to be included, and outlines an approach to developing laboratory exercises to engage these concepts.
Keywords: GIS, education, curriculum

John S. Pipkin,
Department of Geography and Planning, University at Albany, State University of New York

The View from New Haven: Timothy Dwight's Urbanism, 1796-1817

Agrarian republicanism of the early National period and the romantic symbolic landscapes of the American Enlightenment were equally inhospitable to cities, manufacturing, and urban "mobs." The historical geography and politics of New England, however, were particularly receptive to urbanization and industrialization. This paper examines the presentation of several key cities in the *Travels* of Timothy Dwight, President of Yale and *de facto* leader of the old order in Connecticut. We examine Dwight's construction of urbanism and his use of tropes such as "improvement," "refinement," and "industry" to integrate the rural and urban worlds into a conservative symbolic landscape. *Keywords: historical symbolic landscape*

Keith A. Ratner,
Geography Department, Salem State College

Why We Need to Measure Our Roadways

Many roadways in the United States are georeferenced and measured. This information is used for locating roadway features, managing pavement condition, and allocating funding. Previously, this information came from construction drawings and by driving roads with a measuring

instrument. Today, technology has entered the arena. GPS units mounted on digital photosvans collect positional information and digital photos of roadways every ten meters. Orthophotos and GIS now help examine and analyze roads. Considering these changes, this presentation answers the following questions:

What's really changed with this new technology?
Are our roadways better off?
Are there problems with multiple sources of roadway information?

Keywords: Transportation, GIS, government

Alex Reges Carniel,
D*epartment of Geography, Central Connecticut State University/UDSC*
Francisco Henrique de Oliveira,
Geography at UDESC

The Raising of Pigs: An Environmental Problem for the Region West of Santa Catarina State

The West of Santa Catarina, a relatively recently settled region of this State (a little more than half a century of effective colonization), has an economy based in meat production, principally chickens and pigs. This activity has developed through a level of integration between family producers (primarily small farms) and urban-based processing companies. Some companies have become major exporters shipping to more than 30 countries around the world. The raising of pigs for commercial purposes began with the colonization of this region by Italian immigrants. This activity has increased quickly in the two last decades, and has become a significant environmental issue - 90% of the region's surface waters are contaminated, principally by pig manure of which there is currently about 40,000 cubic meters per day being generated. Throughout the west, there are many artesian wells in use, reaching down as far as 800 meters or more into the Aquifero Guarani. There is some concern that these wells could become a pathway of contamination into the aquifer. The economic data for Santa Catarina show a continuous increase on invoicing pork, for sale in the domestic market but with exports playing an ever larger role. For the many people, this is a significant development that requires special attention to the growing environmental questions. This presentation will consider whether it is possible to reconcile future economic growth with environmental preservation in Santa Catarina's western areas.

Keywords: Brazil, Santa Catarina, meat production, contamination, preservation

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Daniel Regis Filho,
Department of Geography, Bridgewater State College/UDESC

Webmapping Applied for Urban Planning

The availability of interactive maps on the WEB comes popularizing the SIG. Today any user of the computer network can access geographic data from any part of the world. In this context of

widely distributing GIS information, the state of Santa Catarina - Brazil, proposed the generation of a website with a series of thematic cartographic products, tied to local and regional databases. The thematic maps of the Itacorubi watershed, the study area, were published through open source software called MapServer. The use of this software encourages research and academic cooperation as it does not incur high acquisition costs. This Webmapping structure also allows free database accessibility to a wide variety of public agencies and private concerns. As such, this project creates a portal for georeferenced data and graphics with the aim to improve decision-making throughout the state by both public authorities and private companies.
This presentation will discuss how this information is organized and made available for the public access as an important tool for the urban planning through analysis of the evolution of the land use in the study area through such tools as aerial photographs from 1938, 1957, 1977, 1994 and 2002, and high resolution satellite imagery from Quickbird 2001.
Keywords: Urban, planning, interactive web maps, information availability

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Nancy Rogalsky,
Elementary Instructional Support Teacher at Farm Hill School, Middletown, CT.

GEOLITERACY: Using the Power of Children's Literature to Teach Geographic Concepts

Children's literature can be used to teach many geographic concepts. The utilization of picture books to teach the five themes of geography will be demonstrated. Examples of specific guiding questions will show how setting and plot relate to the geographic themes of place, location, human-environmental interaction, movement, and regions. Connections will be established between geographic inquiry and specifically teaching comprehension strategies. A bibliography of children's literature relating to geographic topics will be available.
Keywords: Five themes, literature, children

Peter Sakalowsky,
Geography Department, Southern Connecticut State University

Teaching Geography Courses Effectively

Teaching geography effectively at any level is challenging. I try to get student involvement by asking questions and asking students to relate the question and the topic at hand to their own experiences or their familiarity with a topic that they saw on TV or the Internet. I also try to relate questions and discussion to the real world both through my own experiences and those issues that have been on TV, the Internet or in films like Al Gore's "An Inconvenient Truth." The wide array of texts with CD's, sample tests, access to on-line interaction through publishers' web sites, the classroom availability of Google Earth and other sources all contribute to getting information to the students. *Keywords: student interaction, web information, classroom visuals*

Tim Salem,
Danbury High School, Danbury CT.

The Promise: A film about the atrocities in Darfur

After implementing a current Multi-Cultural course at Danbury High School, a group of students and I created a presentation designed to bring awareness about the atrocities in Darfur since early 2004. We continue to be very active and in 2005 a brief documentary was created aimed at turning apathy into empathy and action. "The Promise" is a 4-time award winning film that was the catalyst for the state of Connecticut to divest all investments from the Sudan. "The Promise" has received much attention throughout the country and more than 60 presentations on Darfur have been made during the past two years, including to members of Congress on Capitol Hill last year. This presentation will provide the latest findings as they relate to Darfur, including the showing of the film. Tim was the 2006 recipient of the Mahatma Gandhi-Martin Luther King Jr. Peace Award presented by the Connecticut Education Association/ Human and Civil Rights Commission. *Keywords: Darfur, Sudan, genocide*

Tatiana Serebriakova,
University of Connecticut, Hartford Branch

Mapping a Local Park Using GPS and GIS Methods for Local Community Planning and as a Practical Exercise for an Introductory Physical Geography Course

This paper attempts to introduce the unique opportunity to create GIS maps of a park using GPS and GIS methods for a local community and help for undergraduate students studying physical geography. The main purpose of this paper is to show the advantages for a town's community to observe how digital maps can be incorporated into a local planning process to empower town residents and visitors of Salmon Brook Park to make better decisions for themselves as well as for the town departments to better coordinate and integrate local development initiative into a more cohesive whole. The Salmon Brook Park project is a local community based project which will provide undergraduate students with the real life data to work on a physical geography exercise. While studying geography and learning GPS and GIS methods the students will gain a range of valuable skills extremely useful for practical usage of physical geography and GIS. *Keywords: GIS maps, local community, physical geography, park*

Steven E. Silvern,
Department of Geography, Salem State College

Collaborative Teaching and Learning in Introductory Geography Courses

Much has been made of the potential of information technology and the internet to transform teaching and student learning. In this presentation I discuss two efforts I have been involved in that employ these technologies to promote collaborative learning in introductory geography

courses. The first effort I will discuss is the use of web-based wikis for promoting student collaboration and enhancing student learning in a world regions course. Second, I will discuss my experience in an online international collaborative geography learning project sponsored by the AAG. This project, called the Online Center for Global Geography Education, involved pairing my Introduction to Geography class with a geography class in Eritrea and using on-line modules or lessons to promote collaborative learning through intercultural on-line discussions of population geography. *Keywords: Geographical education, collaboration, instructional technology, Wiki*

Benjamin Spaulding And Sarah Stanwicks,
Department of Geography and Map and Geographic Information Center, University of Connecticut

Developing GIS Indexes for Connecticut Historical Aerial Photography

The Map and Geographic Information Center (MAGIC) at the University of Connecticut is home to over 35,000 paper aerial photographs from the state of Connecticut ranging from 1951 to 1995. To streamline searching and viewing of historical aerial photography MAGIC has developed a geographic information system (GIS) index describing the location and attributes of each image in its vast collection. The GIS indexes, based on the center points of each photograph, are described by various attribute data. Complete Federal Geographic Data Committee-compliant metadata and scanned images are also made accessible through the GIS indexes. The development of the database, GIS techniques incorporated, uses of historical aerial photography, and online distribution of indexes and aerial photography will be displayed in a poster presentation. *Keywords: Historical Aerial Photography, Connecticut, GIS Methods*

Note: This will be a poster presentation

Han Suk Ock,
Department of Geography, University of Connecticut

Planning the New City based on the Geomancy: A Case of the Design of the New Multi-functional Administrative City (NMAC)

The Republic of Korea is planning to build the New Multi-functional Administrative City (NMAC). The overall landscape image of the City shows up the modified geomancy model conceptualizing the human-environment relationship in the site, which is symbolized by two flying crane with three Taegueks. In transforming the overall landscape image to urban form, two diamonds arises from the western spatial viewpoint. Juxtaposing of the two diamonds becomes a geometric structure. The three places will be the core area building the main axis.. On the North-South axis from the core of the symbolic green axis, symbolic things will be located, and the administrative offices will be placed on the East-West axis.. Peripherals of the central axis also play a role in developing overall land use from image. The buildings and residents are arranged and located according to undulations and this is based on the oriental theory of

geomancy. People can get within 60 minutes to the NMAC from Seoul using KTX train and the LRT. The LRT plans to run through the south-north corridor to the south end of the city. There are main communication roots which are the arterials of 6~8 lanes, collectors of 4 lanes, the local roads and other feeder roads. We build cultural amenities on the head part of the crane and on the core area. The development of a sustainable city is not just the development, but the development of the sustainable grounds and associated plants and systems.
Keywords: geomancy, landscape image, geometric structure, overall land use, sustainable city

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Jeanne M. Thibeault and Anji Seth,
Department of Geography, University of Connecticut

Simulated Historical and Future Changes in Extreme Precipitation and Temperature Indices for the Bolivian Altiplano

Extreme climate events can have devastating effects on human and natural systems. Projections of extreme events are important to decision makers and stake-holders at the regional scale. As part of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR4), extreme indices for temperature and precipitation were calculated by a variety of climate models for the 20th century and future emissions scenarios. Preliminary results for the 20th century and the A1B scenario for the Bolivian Altiplano indicate possible changes in extreme indices for precipitation and temperature that may impact water supplies and agriculture in the region. *Keywords: climate change, extremes, Bolivia Altiplano*

Note: This will be a poster presentation

Dennis Tobin,
Town of Redding, Connecticut

Connecticut Brownfields: Permits, Inspection, and Enforcement

After winning the competitive EPA 2005 National Award for Smart Growth Achievement – Small Communities Project; the Town of Redding, Connecticut determined a need for a staff geographer to manage the project. In 2006, I took leave of academic pursuits and assisted the municipality with managing this unique public-private brownfields project. I was assigned to permitting, inspection, and enforcement activity of a 55 acre industrial brownfields redevelopment project crossing the Norwalk River, 10 miles upstream from Long Island Sound. I was also responsible for soil erosion/sediment control, wetlands, and demolition inspections, as well as the task of archiving project files. The model of environmental compliance I developed can be applied to numerous brownfield redevelopment projects within Connecticut and New England.
Keywords: brownfields, environmental compliance

David Truly,
Department of Geography, Central Connecticut State University

Popular Music and Geography: A Contextual Teaching Approach

Geographers continue to produce cases studies that demonstrate the geographical nature of popular music in our society. While many of these studies are descriptive, they can be particularly valuable in introductory courses as a tool for enticing students into the discipline as well as introducing them to fundamental geographic concepts. This paper argues that a learner centered approach to teaching can be employed using popular music as a contextual teaching aid. This approach promotes not only critical thinking but also reinforces the importance of geographic thought and inquiry among new students. *Keywords: contextual teaching, learner centered, geographic education , popular music*

Nathaniel Trumbull,
Department of Geography, University of Connecticut

Urban Waterfront Renewal, Participatory Planning, and Lessons to be Learned in New London and New Bedford: A Comparative Analysis

The cities of New London and New Bedford have similar economic histories and geographies, but have approached their urban planning processes as concerns their waterfronts in significantly different ways. This project seeks to examine how urban planning techniques, strategies, and processes have differed for the development of those cities' waterfront areas over the last approximately three decades. A comparative analysis of the waterfront planning experiences of the two cities should permit an evaluation of the extent to which participatory planning approaches (the approach favored by New Bedford leaders) have let to different outcomes than more non-participatory approaches (the approach favored by New London leaders) in order to suggest lessons for other similar cities that seek revitalization and renewal of their waterfronts.
Keywords: waterfront development, urban planning

Timothy S. Vatovec,
Department of Geography and Planning, University at Albany/SUNY

Private Security Firms and the Composition of Landscapes of Defense: Post-September 11th, 2001

The changes in security measures, organizations, and operations, as a result of the events of September 11th, 2001, and their aftermath, have strained traditional military and support services, particularly in the United States. This strain has resulted in the creation of new opportunities for private sector industries to participate in local, national, and international defense. This paper investigates how some of these firms compose and provide security services, which are important factors in understanding their overall effectiveness; together their actions and conse-

quences create unique forms of actual and symbolic landscape: landscapes of defense. *Keywords: Landscape, landscape of defense, private security firm*

Alexander Vias, Jeffrey Osleeb, Peter Hayward, and Brandon Cramer,
Department of Geography, University of Connecticut

Aspects of the Connecticut Health Disparities Geocoding Project

Despite an increased amount of research on health disparities in the United States, analysis at many levels remains hampered by inadequate spatial data. One of the most overlooked aspects of recent work is the spatial context of health disparities. The purpose of this research is to examine these methodological issues using the state of Connecticut as a study area. This research links U.S. Census derived socio-economic data at various levels of geography to a twenty-year Connecticut mortality dataset (from 1985 through 2004). Using a three year sample of the mortality data for Connecticut (1999 through 2001), a pilot experiment is conducted to determine whether there are correlations between contextual variables (e.g., degree of racial segregation, income inequality, immigrant status, poverty/education levels, environmental factors, etc.) for specific spatial areas such as neighborhoods or towns and mortality rates relating from all causes of death from several specific causes (e.g., cancer, diabetes, heart disease, AIDS, etc.). Further analysis examines geographic clusters or "hot spots" of deaths from similar causes. The preliminary results showing correlations between specific contextual variables and causes of death are presented. These results, including the location of hot spots are shown to vary according to the geographic unit of observation. *Keywords: GIS, health disparities, methodology, Connecticut*

Michael Waters,
Department of Geography, Salem State College

Starbucks and Dunkin Donuts: A Locational and Economic Analysis Using GIS

This presentation demonstrates how GIS can be utilized to analyze the locations of two competing business chains on a statewide level. Despite selling products of a similar nature, Starbucks and Dunkin Donuts are well known for attracting customers from different socioeconomic backgrounds. By comparing relevant aggregate demographic information pertaining to the neighborhoods around these two chains in Massachusetts, I was able to explore whether or not these stereotypes were visible in the statistics generated. The results suggest different locational practices for each company. *Keywords: GIS, business, locational analysis*

Eric West and Joseph Polka,
Department of Geography and Department of Sociology, Southern Connecticut State University

Encouraging Interdisciplinary Study of GIS in Undergraduate Education

Little attention has been given in the literature to methods for encouraging undergraduates not majoring in geography to enroll in GIS courses. Majors from geography and from other disciplines can benefit from applying GIS, particularly to real-world problem situations. This NESTVAL 2007 Conference paper will describe the structure, content, and results of a workshop called *The American Dream: Visualizing Social Problems and Analyzing Their Spatial Patterns.* The workshop was created to give participants from geography and other disciplines an interdisciplinary, collaborative, and active learning experience. The central activity revolved around using GIS. Demographic analysis of student participants indicated ten separate majors and faculty from three academic departments. This study contributes to the literature by showing how an interdisciplinary workshop can be used to generate interest in GIS and to build connections between academic departments. *Keywords: GIS, active learning, interdisciplinary*

Richard L. Wolfel,
Department of Geography and Environmental Engineering, United States Military Academy

What's Old is New Again: The Reintegration of Dresden's Landscape into the Modern German State

An important recent development within geography has been an engagement with the idea that the landscape is not just a stage on which actions occur, but is part of the process of societal development. This research examines the architecture of Dresden in the era of East/West Reunification. Traditional theories of German national development have focused on two foci for post World War II development, the Geopolitics of Nostalgia and Zero Point Thinking. This research suggests that these two theories explain the modern development of Dresden as the city attempts to forget about both World War II and the East German era.
Keywords: Dresden, Post-Socialist urbanization, German unification, nationalism

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Bob Amey
Bridgewater State College

New Urbanism Not Enough to Overcome New Economic Reality?

Westborough (MA) recently completed a project that falls into the realm of smart growth/new urbanism by providing a retail district - including a grocery store - in the town center. Recent economic trends, however, are stalling the project, and this paper will look at the goals of this development compared to what the current state is, including the rental situation for vacancies, the current leaseholders, the housing market (the project includes a large number of high-end condominiums) issues, amenity cutbacks, and what many townies now see as a project so long delayed by regulations that many feel it may never fulfill its promise. This is a part of a continuing series looking at new urbanist development in MA, and on the Westborough project in particular.

Juliana Baretta
Universidade do Estado de Santa Catarina & Bridgewater State College
Mauricio Aurelio dos Santos
(Universidade do Estado de Santa Catarina)

Economic History of the Central Western State of Santa Catarina, Brazil.

We analyze here the origin of it's capital that funded the industrialization process in that area, which is the latest in Santa Catarina. In other regions of the same state we have different and older processes of occupation, funded by public and private organizations. In the discussed area, that process was spontaneous and started in the beginning of the last century.
The occupation of the Central Weastern State of Santa Catarina was a rapid process, derived from the urge in occupying that area with brazillian people, because Argentina also wanted to occupy that area. The first settlement was Chapeco, in 1882, and the first settlers were gauchos/italian-german descendents. The construction of the Sao Paulo – Rio Grande railroad also started by the same time, which brought development and people, who worked exploring the forests and Yerba maté.
The occupation was organized in the distribution of small portions of land to families, which would cultivate or explore the area, and sell the goods for the rest of the country trough the railroad. They were primarily farmers but also some of them started manufacturing. Some of them could accumulate more capital than others, resulting in social differentiation.

Kenneth B. Beesley
Brandon University

The Rural-Urban Fringe: Selected Issues in the New Canadian Countryside

The rural-urban fringe is an environment where competition for land is high, where conflict involving different land uses and differing social values can be divisive, and where most accretionary urban development is going to happen. For many cities and towns in Canada, the rural-urban fringe is: an agricultural landscape, a place for unwanted urban land uses, a space for larger urban-related recreational-tourist land uses, and a place for more urban development. Almost all urban places want at least some new development, whether at the edge or as in-fill. Urban growth in the rural-urban fringe is often referred to as 'urban sprawl,' however, that is only sometimes accurate. In many rural-urban fringe areas there are pressures to preserve the agricultural land and an agricultural way of life. The land can be protected, but there are no assurances about the lifestyle.

Bruno Bortoli
Universidade do Estado de Santa Catarina & Bridgewater State College

The Connections Between the United States and Brazil: an Analysis of the Social Networks Connecting Criciúma and the United States

The increasing number of Brazilians emigrating has put new questions and issues to those who live this experience of being in two different places – Brazil and the USA. The rising of emigration spots, the number of illegal emigration networks, as well as new communication technologies that facilitate the exchange of information, developed complex social networks. This paper expect to analyze how these social networks are created, articulated, are kept and modified by the migratory process. The data was collected trough observation of the everyday life of the city, interviews with returned migrants and/or their families who were left behind and analysis of local newspapers, which pictured us the actual meaning of social networks and its connections. The aim is to demonstrate how migration has changed the life of Criciúma in this new millennium, trying to understand the impact of migration on both parts, the ones left behind in Brazil and the ones who went away. We also analyze the creation of a social imaginary about migration based on the speeches of the first migrants and newspapers with articles about migration, checking whether those articles are stimulating or not the idea of migration as an alternative in moments of crisis.

Brendan M. Buckley
Lamont-Doherty Earth Observatory
Masaki Sano
Ehime University
Truong Mai
Hong Nong Lam University
Minh Ton That
Bidoup Nuiba National Park

Southeast Asian Hydroclimatic Variability over the Past Seven Centuries: Tree-Rings and Historical Records of Megadroughts and their Possible Impact on Regional Kingdoms

There is a need for understanding the natural range of climate variability in the heavily populated and agriculture-dependent regions of monsoon Asia, to ensure sound planning decisions in the face of expected hydrological changes associated with global climate change. As part of a US National Science Foundation-funded project (Tree Ring Reconstructions of Asian Monsoon Climate Variability) we have produced climate-responsive tree-ring records from throughout tropical Asia that span much of the past 7 centuries. We find compelling evidence for 18th century decadal-scale summer monsoon failures that span from India to Vietnam. Historical records corroborate periods of severe drought across much of the region during this time, though these records are sparse and tell little about the regional extent and severity of drought. Speleothem and coral records suggest multiple decadal-scale droughts for much of the Little Ice Age period in India, and elevated Sea Surface Temperature (SST) during the 18th century for much of the tropical Pacific, respectively. Tropical Pacific SST anomalies are seen as one key component to monsoon variability over the study region, with El Niño and La Niña like conditions resulting in rainfall reduction or increase, respectively. Persistent anomaly trends in the SST fields can result in the kinds of decadal-scale variability our studies suggest, although this is not the entire story. We explore the role of the Interdecadal Pacific Oscillation (IPO), first defined in 1999 as a Pacific-wide measure of variability that is physically distinct from both the Pacific Decadal Oscillation (PDO) and the El Niño Southern Oscillation (ENSO), in contributing to protracted "mega-droughts" in the region related to weakening monsoon strength. Recently, we have located and sampled near-millennium-aged conifers from Vietnam and Laos and developed absolutely dated, drought-sensitive time series from them. We now have evidence that the period of the late 14th and early 15th centuries experienced severe protracted drought that likely contributed to the demise of the great Khmer civilization at Cambodia's Angkor Wat.

Charles E. Button
Central Connecticut State University

A Vision of Carbon Neutrality and Environmental Sustainability at Central Connecticut State University

Spurred by on-campus grassroots urgings and the leadership of university administration, Central Connecticut State University has embarked on a journey towards having a carbon neutral and ecologically sustainable campus. This paper will discuss the steps CCSU has taken to realize this vision. Detail will be provided about why and how this movement was initiated at CCSU; how the University's administration has demonstrated commitment to the effort; how sustainability curriculum is being created; what has been accomplished so far; and what CCSU's goals are for the future.

Brian M. Cacchiotti
Salem State College & The University of Minnesota

Wind Variability and Spatial Synoptic Classification

Integrating wind power into an existing energy distribution grid raises problems based on the unreliability of the wind. Using high-frequency wind variability findings (10-minutes) at a 90-meter test site in Southwestern Minnesota I will correlate these findings to Dr. Scott Sheridan's Spatial Synoptic Classification system, in an effort to better quantify the uncertainty inherent in predicting wind energy output.

Andrew Caiazzo, Rachel Shmookler, Val Locker, Samuel Blanchard and Nick Bumbarger
Clark University

Integrating Remotely Sensed Data and Environmental Variables to Map Forest Cover Types in Massachusetts

The purpose of this poster is to present the results of a statewide land-cover mapping effort (circa 2000) of Massachusetts. The methods presented here identify best practices for atmospheric and geometric preprocessing, data integration, and classification techniques determined through pilot study research, for regional mapping programs. These practices were developed to be generalizable across landscapes for other regional mapping studies. Five multi-seasonal Landsat ETM+ scenes, in combination with environmental variables, were individually classified and mosaiced to produce a seamless land-cover map for the State of Massachusetts with an overall kappa index of agreement (KIA) of 0.82.

Robert B. Carver and Pascale M. Biron
Concordia University

Evaluating Sediment Transport Around Fish Habitat Enhancement Structures in the Nicolet River (Québec)

Stream restoration efforts often include the use of instream structures such as current deflectors to create, maintain or enhance fish habitat including deep, cool pools which provide refuge to fish. There have been few field studies on the long-term effectiveness of these structures, especially concerning their influence on sediment transport and stream morphology. Here, we evaluate sediment transport around a pair of boulder deflectors in the Nicolet River near Victoriaville, Québec, by tracking individual clasts implanted with passive integrated transducer (PIT) tags, and measuring their responses to different flood events. Rocks were PIT-tagged, weighed and measured, then laid out in transects upstream of and between the deflectors. Their locations, surveyed with a total station, were recorded regularly after flood events and analysed using a GIS framework. Pressure transducers were installed upstream and downstream of the study area to measure flow depth and water surface slope, providing estimates of bed shear stress. Individual particle movement is evaluated against estimated shear stress and the clasts' physical characteristics on event- and seasonal scales. These relationships are difficult to quantify but there is evidence that smaller particles move through the deep pool zone and downstream, while larger particles accumulate in the pool area. It is important to determine whether these larger particles will eventually fill up the pool zone, requiring costly and detrimental maintenance in the restored reach. Further study will also allow mass balance models to be verified and provide insight into the long-term viability of these and other instream structures.

Janelle Cornwell
University of Massachusetts

Seduction of the Subject: a Methodological Examination of Experiential Knowledge Production with the Valley Alliance of Worker Cooperatives.

This paper is an exploration of researcher subjectivity. I document my ethnographic experience with the Valley Alliance of Worker Cooperatives, specifically, the experience of trying to turn my dissertation into the project of opening a worker-owned café. On the one hand, I consider what little the movement could (and did) learn from this failed attempt and on the other I consider an internal struggle between "material" and theoretical performativity. Charting an emotional geography of attraction/aversion to the "objects" of research, I look at the various desires cultivated by my research with three very different organizations and whether or not this kind of self-reflection might have any value in an academic world.

Brandon Cramer and Jeffrey Osleeb
University of Connecticut

An Analysis of Alcohol Related Mortality in Rural Connecticut

This paper analyzes mortality in rural Connecticut from 1985 to 2004 due to the effects of alcohol abuse. Mortality data from the Connecticut Department of Public Health was geocoded for this analysis and aggregated to the ZIP Code level. The results show that apart from central cities, the highest rates of alcohol-related mortality in Connecticut tend to be located in old mill towns scattered throughout rural areas of the state.
The fastest rising alcohol-related mortality rates are also found in rural areas of Connecticut, possibly as a result of the increased poverty that has accompanied the loss of manufacturing jobs from these parts of the state. Many rural areas of Connecticut are also experiencing a significant number of young deaths from alcohol-related conditions. This can largely be attributed to fatal drunk-driving accidents, which are likely to occur when people drive under the influence on rural Connecticut's narrow, windy roads at high speeds.

Brad Dearden and David Irwin
University of Maine at Farmington
Kevin Knight
Northland Baptist Bible College
Addie Qualey
Gorham Savings Bank

Fertility Patterns and Assessment of the Unmet Need for Family Planning in a Kakchiquel Town, Guatemala.

Guatemala maintains one of the highest fertility rates in the western hemisphere, driven largely by a high incidence of births among the indigenous Maya. Though traditionally negligible, demand for family planning information and modern contraceptive methods among the Maya is increasing incrementally. Yet for some groups, cultural or religious barriers discourage their participation. This research assesses the unmet need for family planning at the local level, in the predominantly Kakchiquel Maya town of Comalapa, Guatemala. Unmet need is defined as the percent of fecund women exposed to the risk of pregnancy who wish to delay or space their births or do not desire additional children, but are not currently using a method of contraception. Because abortion is illegal in Guatemala, unwanted pregnancies contribute to above average occurrence of self-induced abortions and maternal mortality rates. The study utilizes a structured survey to gather data on fertility trends as well as family planning awareness, prevalence, and attitudes. Findings are set within Comalapa's existing social and economic landscape, which, for those wishing to manage their fertility, poses challenges with respect to poverty, language differences, religious standing, and typically limited access to both information and contraceptive methods.

Stephanie L. Derrick
Keene State College
Robert G. Cromley
University of Connecticut

Using GIS to Solve the Location Set-Covering Problem in a Bounded Plane

One of the simplest location models in terms of its constraint structure in location-allocation modeling is the location set-covering problem (LSCP). Although there have been a variety of geographic applications of set-covering problem (SCP), the use of the SCP as a facility location model is probably the most common. In the early applications of the LSCP, both potential facility sites as well as demand were represented by points discretely located in geographic space. Depending on the scale of analysis, a point representation of facility sites is not as problematic as the representation of demand as being concentrated at area centroids. The advent of geographic information systems (GIS), however, has made possible a greater range of object representations that can reduce representation error as well providing the manipulation tools for expressing the spatial relationships imbedded in facility models. The purpose of this presentation is to outline a methodology using GIS and central place theory for solving the LSCP when demand is continuously distributed over a bounded area and potential facility sites have not been defined a priori.

Katherine C. Donahue
Plymouth State University

Tanzanite: From the Foothills of Kilimanjaro to the Shops of Key West

This paper explores the process of commodification of tanzanite, a semi-precious gemstone discovered in the 1960s south of Mt. Kilimanjaro, Tanzania. Actively mined only since the 1980s, tanzanite is more rare than diamonds because the source area is limited to the Mererani hills east of Arusha. Cleverly marketed in the West, eighty percent of tanzanite is bought by Americans. The gemstones reach these markets through Maasai middlemen, foreign buyers, processors, cutters, polishers and dealers in Tanzania, India, Hong Kong, and the United States. Production of the stone is occasionally slowed by flooding, accidents, and conflict over rights to mining areas. Children and teenagers are employed in the mines. These miners suffer death and disease not only because of unsafe mine conditions but also because of drug use and HIV/AIDS. Furthermore, Daniel Pearl of the Wall Street Journal linked al Qaeda to the tanzanite trade. The paper is based on field interviews with buyers and sellers in Tanzania and in the United States, as well as analysis of media reports of attempts by the Tanzania government to control the illegal export of this new commodity.

Henrique Dorneles de Castro
Universidade Federal do Rio Grande do Sul/Bridgewater State College

The Influence of the US Urban Model in the Development of Gated Communities in Brazil.

Brazil is passing through urban shifts, many of them designed to the elites and inspired in the architectural and urban model of United States. This new way of living that grows in Brazil is based on the runway of people from the town, searching protection from the danger saw in the heterogeneity of the downtown. Wealthy people go to gated communities, outside the center of the city, seeking isolation. This process is allowed and encouraged by many factors, such as violence, ideology, and the new possibilities of technology. This new gated communities are closed by wall and try to reproduce inside of its wall a suburban model, inspired in the US suburbs. In this paper, there is an analyze of some of these communities in a Brazilian metropolis (Porto Alegre) and a comparison with some suburbs and gated communities in the US. It`s sought to make consideration between both, deepening the knowledge about this way of living in brazil. Our focus is the spatial aspects of these structures, paying attention to the built space, and the possibilities of interactions that this built environment provides to the people inside and outside the gates.

Katherine Driscoll and Mirela Newman
Southern Connecticut State University

Urban Design and Functions in the Union Plaza, New London, Connecticut

Union Plaza is a very small park located in the central hub of New London, CT. The space, which once served to muster troops for the American Revolution, was once a place of commerce during the whaling era, and is now used as a municipal park. The 1960s urban renewal aimed to create a promontory from which to view the Thames River. This project maligned the park's function as a gateway to the downtown. Traffic engineering and the design of the park have limited the pedestrian access and friendliness of the area. This year, 2008, New London will break ground on a new design for the park. The aim is to improve access to the park from the business district, transportation, waterfront and parking. This paper discusses the current urban design, form and functions of the Union Plaza municipal park, while highlighting the way it really functions for the city of New London and its dwellers. The paper also provides a brief historical background while also looking at the future functions and layout.

Robert Flanagan and Mirela Newman
Southern Connecticut State University

Urban Design and Functions in Waterbury, Connecticut: Two Point One Acres of Heaven

This paper discusses a case study centered on the City of Waterbury, Connecticut located in the heart of the Naugatuck River Valley and is approximately 100 miles from New York City, about one hour from Stamford and a half hour from New Haven, Bridgeport and Hartford. This central location in the state of Connecticut' economic corridor has and should position Waterbury relatively well. In addition, its proximity to the lower Fairfield County area has made it as an almost perfect region to become a bedroom community to that area, as housing prices, while expensive, are more reasonable than either Stamford or New Haven. This paper focuses on the discussion of the design and functionality of Waterbury's "Green" which is located at the center of the city of Waterbury and its surrounding area. The Waterbury Green also occupies the center of the Central Business District (CDB). The Waterbury Green area is where some of the first settlement of the city took place. The main purpose of the Green is to provide a central gathering place for the city and to be the hub of commerce for the region.

Brian Gagnon, Brian W. Eisenhauer and Katherine C. Donahue
Plymouth State University

Human Dimensions of Marine Protected Areas in and near New Hampshire Coastal Waters

Funded by NH Sea Grant, three investigators from Plymouth State University conducted in-depth interviews with 20 fisheries-related stakeholders concerning their (1) definitions of, (2) knowledge of, and (3) attitudes toward Marine Protected Areas (MPAs) in and near New Hampshire's coastal waters. The stakeholders were purposively selected to ensure a wide representation of occupational perspectives, ranging from public policy makers to private whale watch boat owners and sport fishermen/anglers. Snowball sampling techniques were used to identify interviewees after the initial participants were selected, and a semi-structured interview protocol was used to collect the data, allowing for additional discussions of topics of interest. Data from the interviews were analyzed for conceptual categories and patterns relevant to the protection of marine areas in the Gulf of Maine. As might be expected, definitions, knowledge, and attitudes toward Marine Protected Areas varied according to the occupations and roles of the interviewees. Those stakeholders responsible for the creation and implementation of marine policy were knowledgeable regarding the definitions of MPAs and were favorable toward continued establishment and maintenance of these areas, while private entrepreneurs were concerned that restrictions on resources in NH and Gulf of Maine waters would be implemented without adequate consultation with stakeholders.

Christina Hamm
Clark University

Institutional Interplay and Transformation

In an effort to promote sustainable use of common property resources, or avoid the institutional failure associated with Hardin's "Tragedy," there has been an emphasis on getting the institutions right. Moreover, there has been a call for "designing complexity to govern complexity" (Ostrom, 1995) where knowledge and conditions inform functional arrangements employed at levels most appropriate to achieve efficient and sustainable resource use. While there may be a tiered, nested, or even outwardly hierarchical arrangement that frames and connects institutions (and organizations) at various scales, multi-level governance frameworks are not necessarily fixed, nor nested neatly. There is interplay. On the one hand, institutional interplay may strengthen existing arrangements where informal and formal institutions overlap, nest, complement one another or are otherwise in agreement. On the other, interplay may be conflictual, where one set of institutions plays against and is privileged relative to others. Therefore, interplay has the potential to transform the landscape - institutionally and geographically. In an island-based lobster fishery in waters bordering three states, there has been an effective dissolution of local institutions – that is, long-standing territorial boundaries and local practices have been challenged and ultimately erased by leveraging and rearticulating stakeholder-actors, institutions, and networks at multiple scales.

Carol Harden
University of Tennessee
Keri Chartrand
Tennessee Valley Authority
Erich Henry
Blount County Soil Conservation District

The Case of the Disintegrating Streambanks, East Tennessee

Causes of streambank erosion are understood to include the force exerted by high-stage discharges and/or the mass failure of oversteepened banks. However, our ongoing study of streambanks in low-order tributaries of the Little River in east Tennessee documents an additional set of erosion-causing conditions and processes. Since August 2006, we have regularly measured bank erosion pins at 17 cross-sections along five tributaries of the Little River. Observed rates of change have greatly exceeded expectations and demonstrated widespread bank instability in the watershed. Two commonly occurring bank erosion scenarios were unexpected: erosion on streambanks above the highest stage reached by streamflow, and dramatic undercutting of banks during drought. The bank erosion study, part of an EPA Targeted Watershed Initiative, continues through 2009. Our preliminary findings have important implications for modeling and for strategies used to reduce stream sediment loads.

Emily Harrison
University of Vermont

Trace Metals in Peabody Pond and Jordon Pond: A Case Study of New England's Historic Landscape Change in the Former Mill Ponds of the Scituate Reservoir Watershed, Rhode Island

Peabody and Jordon Ponds, abandoned industrial mill ponds within the Scituate Reservoir Watershed in Rhode Island were analyzed using sediment core analysis to determine whether the sediments within the ponds were contaminated with trace metals as a result of historic mill activities. Although high levels of lead were discovered in Jordon Pond, the source appears to be from contemporary road and development activities, rather than historic mill activities or other previous land use activities. This paper contributes to the limited literature on historic mill pond analysis, and to research on contemporary development-related environmental changes in New England.

Aimee Higgins
Bridgewater State College

The Effects of Land Cover Variability on Evapotranspiration in the Llanganuco Valley

A process-based understanding of land cover impacts on evapotranspiration (ET) in alpine valleys is lacking. It is conventionally assumed that ET is a negligible part of the water cycle in the Peruvian Andes due to lack of precipitation during the 6-month dry season and high humidity during the 6-month wet season. However, recent research from an embedded sensor network indicates that ET is an important part of the Andean water cycle. Water resources in Peru are affected by the glacial melt in the Cordillera Blanca. This project incorporated GIS, remote sensing, meteorological data and ET modeling to further show that ET is affected the valley's terrain and land cover and it varies according to seasonal and daily time scales. This project applied the FAO 56 Penman Monteith method of ET modeling which has been used successfully in the Alps and the Bolivian Highlands. The Llanganuco Valley has distinct diurnal as well as seasonal cycles, as shown by hourly meteorological data. Similar cycles were also found in ET. In addition there were significant differences in ET within the valley. This research emphasizes the need for better understanding of multi-scale processes in alpine valleys.

Andrew J. Huddy
University of Connecticut

Farming Alone - An Examination of Social Capital in New England's Rural-Urban Fringe

General concern in society about the loss of productive farmland to development associated with expansion of urban and residential areas is typified by growing heterogeneity of land use within the rural–urban fringe. Efforts to understand this process have incorporated policy, socioeconomics and environmental factors to study land use but have often neglected to consider that the agent that must ultimately make the decisions concerning disposition of the land is the owner farmer. This research develops the concept that farmer social capital at the household level is critically linked and significantly influences spatial characteristics of land use at the rural urban fringe.

Leo Hwang-Carlos
University of Massachusetts, Amherst and Greenfield Community College

Re-envisioning Models of Economy: Community and Creativity in Rural Western Massachusetts

This paper explores a few models that try to reframe the discussion around how Franklin County, Massachusetts creates an economic identity that is based around a sense of community, creative capital, and a sense of place. By raising an awareness of the community's existing assets and opportunities, the hope is that the performative impact will extend into altering how the multiple economic realities relate and support one another. Franklin County is Massachusetts' most rural 702 square miles, and is classified by the 2000 U.S. Census as one of the lowest per. capita income rates for the state, however the standard economic measures give an incomplete picture of the region. For the past three years, the Fostering Arts and Culture Partnership has worked to forge relationships in Franklin County between artists, area business leader, community leaders, and non-profits to create a way to pool ideas and resources for systemic approaches that value individual identity and the unique possibilities embedded in the rich history and progressive ideals of the region.

John Krueckeberg
Plymouth State University

Six-and-a-half Degrees of Separation: Biogeography and Jefferson's Rational Racism

Naturalist and cartographer, Thomas Jefferson's world-view towards race relations was shaped by his explorations into what today we call biogeography. Historians traditionally have character-

ized the author of the Declaration of Independence as conflicted or described him as "a Sphinx" when they tried to reconcile his racism to his expressed ideals of human equality. This paper shows that there was no contradiction when one understands Jefferson the biogeographer, a scientist who continually divided the world into four quadrants, compared and contrasted the species in those spaces, and presented one vision of African equality to the public and another in his personal papers to friends – the latter vision in-line with his biogeographical studies.

James V. Lyons
Worcester State College

Error in the Pursuit of Simplicity: The Theory of Plate Tectonics as Depicted in Introductory Earth Science Textbooks

Many educators in the Earth Sciences have at times been poorly served by teaching materials containing outdated or even misleading ideas concerning Plate Tectonics and the Earth's interior. Some of these errors are longstanding such as the notion that convection in the Earth's mantle is responsible for plate motion. Still others involve the confusion that arises when key terms are assigned multiple roles in the grand scheme of things. The term lithosphere is a good example of this having apparently been defined at varying times on the basis of its compositional, dynamic, rheological, seismic or thermal characteristics. These concepts are hardly equivalent. Finally, there have been numerous additions/revisions to the theory as it evolved that have often been missed or ignored. Does heat from below actually drive mantle upwelling or does it occur along divergent plate boundaries simply to fill a void? Has it not been established that most volcanoes in hot spot chains do not exhibit the linear age progression as predicted in theory? This ongoing challenge to the plume/hotspot hypothesis represents a potential rearrangement of major proportions to the existing scheme of things but it has not yet made an appearance in textbooks. All of this might not amount to much were not for the fact that the Theory of Plate Tectonics is the major organizing framework for the study of the Solid Earth.

MaryAnn McGarry
Plymouth State University and Hubbard Brook Research Foundation

Comparing Earthquake Risk in Pakistan and New Hampshire: Surprising Discoveries

After the Kashmir earthquake shook Pakistan in 2005, killing an estimated 79,000, Plymouth State University hosted 20 Pakistani educational leaders, many of whom had lost family members in the disaster and bemoaned the lack of earthquake risk assessment educational material. So, in the fall of 2006, Professor McGarry took on the task of having her undergraduate Hazardous Earth science course students develop educational information to share with Pakistani educators and their students. From this initiative, a cross-cultural, interdisciplinary, hands-on

middle school unit was created and piloted in a local school. The essential question guiding the development of the curricular unit was- How does learning about earthquakes in Pakistan connect with the lives of New Hampshire students? McGarry will share highlights from the unit, including activities, satellite maps, and other teaching resources incorporated in the unit, as well as results from pre and post tests that were administered to document the students learning. The following summer of 2007, the middle school students and a new group of Pakistani educational leaders joined together to share insights. McGarry, who has an earth science background, was surprised to learn that New Hampshire is at moderate risk for earthquakes, where neighboring Vermont is at low risk. This led to investigations on the theories of why New Hampshire, in an intraplate location, is at higher risk. These theories will be shared as well.

Jo Beth Mullens
Keene State College

Lessons Learned on New Hampshire's Rivers Management and Protection Program's 20th Anniversary

New Hampshire's Rivers Management and Protection Program marked its 20th Anniversary in 2008. Through a combination of state and local initiatives, the program encourages protection and restoration of rivers through local river corridor management plans as well as new policies and monitoring programs. Currently 15 rivers, or river segments, within New Hampshire have been incorporated into this program. The goal of this study was to assess the NH Rivers Management and Protection Program in regards to its effectiveness in restoring, protecting and integrating river management in designated watersheds. A brief overview of integrated river management and the New Hampshire Program is first presented; followed by a program assessment. The assessment consists of an evaluation of activities and policies established under this program and the results of a program evaluation survey given to local advisory commission leaders in each watershed. The paper concludes with strengths and weaknesses of the program that have emerged over the past two decades, and offers recommendations to advance goals of the program in the future.

Mirela Newman
Southern Connecticut State University

Sharing with Peer NESTVAL Geographers: the Structure and Nature of the Urban Studies Program at Southern Connecticut State University

In the past several years, the Urban Studies Master's Program hosted under the umbrella of the Department of Geography at Southern Connecticut State University in New Haven, Connecticut, has undergone substantial changes and improvements. This program is the only Urban Studies graduate program in New England and currently has three distinct tracks including: urban planning and land development, urban management and urban education, with a fourth

track currently under development. The main goal of this illustrated paper is to showcase the current structure, tracks and course offerings, while also highlighting the nature and quality of course offerings. The author aims to show and share with interested conference participants several Urban Studies program and course related materials including selected program brochures and course syllabi, and to answer any question from peer geographer colleagues potentially interested in this program for their current students. Also notable is the fact that two of our Urban Studies graduate students are also presenting at this conference, thus contributing to the dissemination of information on the program and the kind of urban research conducted under its umbrella.

Judith Otto
Framingham State College

Planning "The Ideal City of Socialism": Anglo-American Antecedents, Polish Reality

The planned community of Nowa Huta (literally "New Steelworks") near Krakow, Poland, was financed by the Soviet government and built at top speed by Polish workers in the 1950s as a model town for the expression of socialist ideals. Once an obligatory pilgrimage for architects and planners behind the Iron Curtain, the town is now being portrayed variously as a dreary swath of grey apartment blocks and the aberrant product of a totalitarian regime, or more recently, a triumph of rational planning and a source of local pride of place. Do these products of socialism have anything to say to us today? This paper investigates the Anglo-American roots of these planning ideals, and their relevance to current urban planning.

Filiz Otucu and Sheryl L. Shirley
Plymouth State University

Do «Good» Fences Make Good Neighbors?: A Comparative Study of the Israeli-Palestinian and U.S.-Mexican Militarized Borders

As the Berlin Wall fell and the South African apartheid regime collapsed, it appeared that political systems utilizing militarized walls of separation should belong to history. People celebrated and leaders gave speeches exulting the free movement of people and ideas. Within a few years, however, a new fear-driven landscape of separation and walls emerged and was accompanied by the creation of an Israeli separation wall and the installation of new barrier zones between the U.S. and Mexico. Israelis argue that Israel has every right to defend itself against Palestinian terrorism and the Wall is for "security." Opponents claim that the wall violates human rights including: freedom of movement, the right to work, freedom from discrimination, and freedom from collective punishment. Similarly, the installation of U.S.-Mexican barrier zones may threaten the rights of border residents. While acknowledging a state's right to security, this

paper will examine the two cases, the Israeli separation wall and the American barrier zones. By comparing these cases, we will demonstrate that prioritization of national security can undermine basic human rights and it is essential that we as human beings begin to think about those on the other side of the walls.

Kim Peterson and C. Patrick Heidkamp
Southern Connecticut State University

Tourism and Development in Antigua, Guatemala

Since the end of the Civil War in 1996, there has been a substantial increase in tourism and tourism related development in Guatemala. The city of Antigua Guatemala, in particular, has become a popular tourist destination for two reasons: its recent placement on UNESCO's (United Nations Educational Scientific and Cultural Organizations) list of World Heritage Sites and because of its many Spanish language immersion schools. Tourism related development in Antigua Guatemala has had significant physical and socio-economic impacts on the city and its surrounding communities. This paper provides a preliminary analysis of changes in the urban footprint as well as changes in the built environment of the city, and sets the stage for future research focused on the socioeconomic impacts of tourism development.

Timothy J. Rickard
Central Connecticut State University

Agritourism in Connecticut

In Connecticut's rural-urban fringe, dairy, fruit and vegetable and greenhouse and nursery farmers are exploiting the diverse urban and suburban niche markets that represent an alternative to conventional mass production of commodities. The largest percentage decrease in farmland acreage in the nation, high and increasing value of farmland, the decline in "real farms" with a value of over $100,000 in sales and an increasing number of small farmers has led to a vigorous agricultural land preservation movement and the promotion of "Connecticut Grown" products. Direct marketing via farm stands and stores, pick-your-own, and 114 farmers markets have brought together the producers and consumers of fresh local food. Dairy farmers sell ice cream to tourists to diversify. Greenhouse and nursery production, which now has more than half the state's agricultural income, has a healthy direct marketing component. Agritourism allows the farmer to stretch the definition of agriculture. The 27 Connecticut wineries are allowed to purchase up to 75% of their grapes out-of-state. Farms offer hay rides, horse riding, corn mazes, wedding facilities, golf courses, and restaurants. Some farm shops have a variety of food products that originate in the tropics and the northeast as well as on their own and neighboring farms.

Yannick Rousseau and Pascale M. Biron
Concordia University

Geomorphological Impacts of Channel Straightening in an Agricultural Watershed, Southwestern Québec

River straightening was widely used in the 20th century to drain fields more rapidly in the spring and increase food productivity in agricultural watersheds. Although straightening has now ceased, dredging remains the leading strategy utilised in southwestern Québec to counter straightened channels' natural re-meandering processes. This research assesses the geomorphological impacts of dredging straightened agricultural rivers and evaluates alternative solutions addressing bank erosion issues. The case study of the Richer stream, an extensively altered agricultural river encompassing two sharp bends in a reach flowing between a residential area and an agricultural field is examined. GIS analysis of the channel planform allowed the identification of geometrical changes that occurred between 1932 and 2006 and revealed a decrease of 2.2 km in the entire stream length and of 347 m in the residential reach, resulting in slope increases of 32 and 63 percent at the watershed and residential reach scale, respectively. High-resolution topographic data were acquired in the residential reach to capture channel dimensions and shapes six years after it was last dredged. Evidences of river adjustment towards a sinuous layout include a widening of the channel through bank particle erosion and mass failure mechanisms, channel aggradation, and a 6-percent increase in sinuosity. A marked increase of bed shear stress and stream power values in bends suggests their high instability; dredging is unsustainable in this context. The proposed alternative solutions include improved management strategies such as increasing riparian zone or letting meanders redevelop, hydraulic structures, bioengineering techniques and channel alteration. A conceptual model ran for six years suggests that adding a riparian zone would limit the loss in channel capacity.

Tatiana N. Serebriakova
Tri-Campus, Hartford Branch, University of Connecticut
Yuri V. Petrov
Siberian Analytical Centre, Tyumen Branch
Victor A. Osipov
Tyumen State University

Estimation of Investment Appeal: Example of Geographical Distribution of Municipalities in the Agricultural Zone of Tyumen Region, Russia

This article investigates a complex of regional characteristics that define the formation of the investment environment in the municipalities of the southern part of Tyumen Region of Russian Federation. The economic structure of northern autonomous regions, presence of the largest de-

posits of oil and natural gas, severe but unique environmental conditions, orientation of diverse sectors of economy, all these and other important regional characteristics helped to construct a special vector of investment appeal in the study area. Evaluation of the given conditions using Geographic Information Systems(GIS) allow a potential investor to receive the complex review of positive and negative aspects of investment into the economy of municipal units of southern zone of Tyumen Region. The main purpose of author's research is connected to an estimation of the long-term phenomena and tendencies which correspond to strategic plan of the regional development on the one hand, and commercial interests of the potential investors on the other. The results of the research can be of interest for potential investors in the economy of the Tyumen region, local and international business partners of the existing Russian companies, and economic observers of reorganizational processes in modern Russia.

Scott Sharpe
University of NSW, Australian Defence Force Academy
Maria Hynes
Australian National University

The Laughing Present: the Gift of Rethinking Economy

Recent work on diverse economies in human geography has done much to displace logics of exchange, equivalence and calculation and to theorise alternatives. One important alternative economy highlighted in this work has been that of gift giving. In this paper we turn the discourse of gift giving toward our own concerns; namely, the relationship between humour and social change. Analyses of humour's role in generating social change commonly figure humour in an instrumental manner. Humour is seen as a means of pursuing existing ideals or as an effective means of communicating a political or social message, and certainly much humour is used in precisely this way. Our paper explores humour in a different light. Drawing on examples, we suggest that humour is a form that calls for a more experimental and more generous understanding of its relationship to social change.

Meghan Sloan and Mirela Newman
Southern Connecticut State University

Urban Sustainability: Assessing Environmental and Economic Dimensions for Meriden, Connecticut

This paper examines and assesses environmental and economic sustainability dimensions for the city of Meriden, Connecticut. Meriden, Connecticut is a medium size, diverse, former industrial city located in the center of the state. Like many cities throughout Southern New England, Meriden faces various environmental and economic challenges. This paper examines Meriden's overall land use, transportation, housing and economic patterns and development indicators,

which serve as green indicators for the city. Downtown revitalization, environmental cleanup of brown field sites, transit-oriented/mixed use development and flood control are major municipal initiatives. However, many of these projects rely on state and federal aid, often making the realization of these projects difficult. There is a need for greater economic development which will decrease the city's disproportionate dependence on its residential tax base. Residential and non-residential development must be balanced with the protection of Meriden's unique, open spaces. The city's history, natural resources, infrastructure and demographics are discussed as well.

Benjamin Spaulding
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MAGIC 2.0: The Development of Web-Based GIS Applications for Historical GIS Data

The Map and Geographic Information Center (MAGIC) at the University of Connecticut has been a leading source for Connecticut and New England geospatial data for over the past 15 years. With use increasing every year and users becoming more sophisticated MAGIC has embarked on an ambitious project to serve its historical geospatial data through web mapping and web file services using open source technologies. These new tools will allow users to access thousands data files including historical aerial photographs, scanned and georeferenced historical maps, and a growing collection of historical vector data. This talk will outline the development and need of the system and discuss the pros and cons of moving to an open source geospatial data distribution system and website. Items that also will be discussed will include the variety of data formats that are served through MAGIC's distribution system, user feedback, and system performance.

Jeanne Thibeault, Anji Seth and Guiling Wang
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The Future of Drought in the Bolivian Altiplano: Projected Changes in Drought Severity and Soil Moisture

The Bolivian Altiplano is a semi-arid region located in the central Andes of South America. Despite its short and irregular rainy season, the Bolivian Altiplano is an important agricultural region. Agricultural productivity varies because crops are vulnerable to climate and soil constraints. Growing season drought exacerbates the already difficult growing conditions. Precipitation data from several global climate models that participated in the fourth assessment report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) are used to calculate a drought index for the Altiplano, the weighted anomaly of standardized precipitation (WASP). The WASP index is compared to future projections of soil moisture content for

three different climate change scenarios. Results suggest that by the end of the 21st century, soil moisture decreases are larger than decreases in WASP index projections during the early rainy season (SON). In the peak rainy season (JFM), the WASP index suggests that conditions may be slightly wetter by the end of the 21st century, but soil moisture projections show a substantial decrease. It is possible that the large increases in surface temperature that are projected for the Altiplano may partially explain the projected decrease in rainy season soil moisture.

Taylor Vaughn
Plymouth State University

Sherman's Atlanta Campaign and the Topography of Northwestern Georgia

The places in which the battles are fought can have an amazing impact on everything from the smallest of skirmishes to major world history changing battles. Understanding and using the geographic advantages of the land can give you an overwhelming advantage in defeating an enemy. This is made clear during General William Sherman's Atlanta campaign during the Civil War. Sherman shaped the terrain he fought over into a weapon that would ultimately favor the Union. His careful consideration of maps and topography allowed him to capture Atlanta, giving Lincoln the boost he needed to ensure that he would be reelected. Using the Atlanta campaign as an example, I will argue for the necessity of understanding and taking advantage of geographic features in order to ensure military success. Exploring the topography of northwestern Georgia is an excellent way to bring to light a subject that I feel is underappreciated in the Historical field as well as the Geography field.

Ted White
University of Massachusetts, Amherst

Building a Community Economy at a Suburban Farm in Massachusetts

North Amherst Community Farm in Amherst, Massachusetts is one of the last remaining large farms within two miles of this college town's center. This new public farm project on formerly private property simultaneously provides open space preservation and economic development, a combination often considered mutually exclusive. This inquiry looks at the function of diverse economies in the process of creating and promoting this community supported agriculture project on farmland which was nearly lost to upscale housing development. Improved food security and food proximity are among two of the obvious benefits, but what else can this new space offer to the community and what will it require of the community? Drawing on interviews with participants and a two year analysis, this paper considers the ongoing conflicts and synchronicities between formal market exchange, wage labor, capitalist profits on one hand and barter, self-employment, volunteerism and gift-giving on the other in the long term sustainability of this farm.

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Concordia University

Assessing the Success of In-Stream Structures for Restoration of the Nicolet River, a Québec Trout Stream

In-stream structures, designed to improve trout habitat and therefore expected to increase trout abundance, are common in North American streams. However, this practice has been questioned in recent years and a growing consensus is that more research is required to monitor these projects. The objective of this study is to evaluate the success of a restoration projects in the Nicolet River (Québec), where pools were excavated and weirs and deflectors were installed in the 1990s in order to increase pool habitat for trout, which was deemed lacking. A combination of methods is used in order to assess restoration success: field data on physical habitat were collected and trout habitat use was evaluated both by snorkeling and through angler surveys. In order to determine the effectiveness of in-stream structures, the habitat created from these structures was compared to that of the natural pools they mimic. Physical habitat data (water depth, current velocity, sediment size and availability of cover) were collected at 184 transects. Adult brown trout habitat suitability curves were applied to determine the suitability index of restored and un-restored river reaches. In addition, 122 angler surveys were collected which recorded the number, size and species of trout caught as well as the area in which the catch was made and the number of hours spent fishing. Results show that depths are greater, velocities lower, sediment larger and cover more frequent in proximity to restoration structures relative to the natural pools nearby. Two brown trout habitat suitability curves were tested. The restored areas scored higher than the non-restored areas with both curves. The angler surveys and snorkelling highlighted the uneven distribution of trout stocking, fishing pressure and catch. As only a few pools are stocked, and their locations are known to anglers, these pools have the highest fishing pressure and most fish are caught in stocked pools regardless of presence or absence of restoration structures. Though pool habitat has increased and the in-stream structures appear to be creating improved trout habitat, it remains unclear whether trout are utilizing this habitat.