Beautiful and Safe Landscapes for Sustainable Disaster Risk Reduction

Fausto Marincioni, Cristina Casareale, and Kenneth Byrne

Abstract Landscapes are not merely physical resources to be catalogued and managed but are "places with a story, which people take care of and with whom they develop a sense of belonging" (Williams and Patterson, Soc Nat Resour 9:507–521, 1996). Efforts to transform environments to reduce disaster risk, if not integrated with the stories and social and emotional conditions of the community at risk, may face opposition, apathy, or lack of political or financial support. At the same time, in this period of dramatic climate change and increasing disaster risks, efforts to produce only comfortable and beautiful landscapes may create potentially dangerous ones. Drawing on studies, land use planning projects, and risk reduction efforts in Norway, the US, the Netherlands, Italy, Hong Kong, and Chile, this essay argues that integrating environmental aesthetics principles, nature conservation, ecologically oriented landscape design, and disaster risk reduction can help communities create and maintain sustainable, safe, and ecologically healthy environments.

Keywords Mitigation · Adaptation · Landscape · Design

Introduction

Human communities' shaping of the landscape has created functional places for the cultural and material needs of these communities, but has also produced unstable and dangerous landscapes. As humans shape territory to exploit it according to their needs (Gambi 1964), they produce landscapes that facilitate economic activity but can also accentuate natural hazards and the vulnerability of the resident communities. Understanding why individuals and communities shape their territory without considering the risk and the possible consequences of certain choices has long been

F. Marincioni (✉) · C. Casareale
Department of Life and Environmental Sciences, Università Politecnica delle Marche, Ancona, Italy

K. Byrne
Graduate Program in Sustainable Landscape Planning and Design, The Conway School, Northampton, MA, USA

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a subject of research for those who study disasters. Among the various explanations of human acceptance of risk is the notion of "bounded rationality": having to manage a complex situation without knowing all the elements and the possible consequences (the incomplete information framework), individuals and groups seek to achieve satisfactory levels of safety, not necessarily the optimal ones (Alexander 1984; Burton et al. 1978). Mediation between short-term risk and reward depends on many factors, including ethical values and economic considerations in managing resources. Academic debate and public discourse on risk reduction revolve around the circumstances, considerations, and factors that can improve prevention and motivate people to improve hazard-reducing measures. However, an effective scheme of risk management has not yet been reached.

The principles of environmental sustainability are becoming a powerful engine of change in the interaction between human communities and the environment (Camuffo and Soriani 2015; Tinacci Mossello 2008), and various disciplines, including human ecology, landscape architecture, and environmental geography, are exploring the intersection of sustainability and cultural values. For example, the "European Landscape Convention," adopted by the Committee of Ministers of the Council of Europe in Strasbourg on 19 July 2000, combines the principles of environmental sustainability with the idea of landscape as a "common heritage which cooperates to the development of local cultures and is a basic component of the cultural and natural heritage" (Council of Europe 2000). While there may be disagreements within a community and among various stakeholders on what constitutes a beautiful landscape, conversations about how to shape the environment according to principles of aesthetics and cultural values can be a powerful component of disaster risk reduction activities. Considerations of beauty can help drive the transformation of landscapes, even when it involves significant costs, and stimulate actions to prevent and mitigate risks when purely economic considerations may not. The challenge is to integrate aesthetics in the standards and practices of disaster risk reduction, to be able to create recognizably beautiful landscapes that are also stable and safe. Examples of such integrations from all over the world suggest promising potential.

Landscape as Identity and Common Good

Since its appearance, *Homo sapiens* and their predecessors have changed the environment to extract the resources necessary for survival. The transformation of the environment into functional spaces for social and economic development has led to the creation of places and landscapes which represent the synthesis of natural, cultural and social aspects, a landscape with which a community identifies and develops a sense of belonging (Linehan and Meir 1998). The landscape is therefore a product of historical processes enacted by a plurality of actors (Olwig 2007). In the past, the impact of human activity was likely to allow ecosystems to rebalance natural processes, but, since the industrial revolution, the increasing human ability to

shape the territory has resulted in growing environmental impacts, up to the point where some processes may be irreversible (Goudie 2000). In addition, the pressures of an increasing population and the huge consumption of resources are altering the fragile balance on which the integrity, stability and beauty of the landscape itself is based (Leopold 1949). The growing number of disasters, resulting from extreme natural processes intersecting with vulnerable socioeconomic tissues, is one of the most obvious manifestations of the increased fragility of the landscape, threatening the welfare of present and future generations. In this sense, the landscape becomes the space in which we compare the real with the ideal, its current uses with aspirations for alternative uses (Soja 1996; Zanetto et al. 1996; Soja et al. 2007). The landscape has the dual potential to provoke past memories and to prompt completely new scenarios for the future. However, the transition to a concept of the landscape as a common good requires a definition of the link between sustainable land use, ownership, decision-making and risk reduction (e.g., landscape, citizenship, and democratic participation). Through which instruments and institutions should we manage the landscape? What criteria and models should we use to assess changes in the landscape (Castiglioni et al. 2015)? Important ideas in this debate come from ecology (Troll 1939), aesthetics (Carlson 1977), and environmental ethics (Hardin 1968).

To help integrate these principles, we might first clarify what motivates individuals and communities to take action to safeguard their land. The existing literature on the subject highlights attachment to place (Giuliani et al. 2003; Hidalgo and Hernández 2001; Walker and Ryan 2008; Lokocz et al. 2011), the emotional bond that individuals develop with the environment in which they live and with which they try to maintain a close relationship. Closely related is the perception of a local identity (Sharifi and Murayama 2013; Yuen 2005), in which residents feel part of a place and come to understand the environment as constituting some part of their identity, individual and communal. Going beyond an appreciation of scenic qualities, this sense of place attachment, reflecting emotional and psychological responses to certain landscape elements as well as cultural and personal values, has been correlated with an increased willingness to support conservation efforts and the protection of natural and cultural resources (Walker and Ryan 2008).

New Forms of Territorial Governance

The integration of environmental aesthetics and ethics in the territorial planning and development for risk reduction is relatively recent. One of the earliest attempts at such integration is the study conducted by Kaltenborn in the Svalbard Islands of Norway's Arctic region. This area still contains relatively pristine and undeveloped land, yet increasing commercial and tourist activities are substantially and rapidly changing the environment. To counter these changes, local authorities investigated the community's sense of attachment to the place, in order to define a methodology of environmental impact assessment that—unlike past approaches—was not based

exclusively on economic and ecological factors. In the new model, a socio-demographic component is included to help document and predict the effects of the proposed actions on individuals and groups, and to help analyse how resource use and development affect human relationships and the meaning of a place. Kaltenborn argues that people construct images of places that are connected to their emotions and their history. Kaltenborn's study involved giving questionnaires to the inhabitants of the town of Longyearbyen. To document the residents' perceptions of the naturalness of the Svalbard Islands, respondents were asked to indicate their level of agreement with the statement that Svalbard represents a part of the last great wilderness area in Europe. Kaltenborn studied the value residents placed on naturalness by evaluating its existential value (the value of just knowing that a place/resource exists, even if you have no possibility to access it), use value (the value of real use or access to a place), testament value (the value of knowing that future generations will have the possibility to access a place) and option value (the value of a different use of a place). He also studied their perception of environmental conditions and their behavioural responses to climate change. Faced with possible impact scenarios, such as oil spills or increased tourism, respondents indicated for each scenario if they preferred to move their activities elsewhere, to contribute to solving problems, or to not react at all. The results suggest that residents recognize the importance of the Svalbard Islands for their environmental value; they believe their existence provides subsistence to the current generations and should be preserved for future generations. A strong sense of belonging to place also correlates with an increased willingness in the local population to mitigate or prevent potentially dangerous economic activities (e.g., tourism or oil drilling) to protect the local natural landscape, rather than abandon their lands and move to another place.

Similarly, Walker and Ryan (2008) show how a bond with a particular rural environment motivates residents to support actions to preserve natural and cultural environments. The study is conducted in Monmouth, Maine, a town defined by beautiful vistas and open spaces, forests, orchards, and small villages. Maine rural areas represent an important natural and cultural element and a source of resources for local communities. The exploitation of these resources, however, is making major changes in the landscape, and residents, particularly long-term ones, have begun to develop a sense of loss as agricultural and forest lands are transformed into sprawl residential development. The study conducted by Walker and Ryan included the administration of questionnaires that included photos of typical Maine landscapes, to measure residents' level of attachment to the rural environment, their perceptions of landscape change, and their attitudes towards preservation and land use planning. The results show that those living in the area for a greater time have a greater interest in protecting environmental features (in particular, agricultural landscapes, forests, and cultural elements) from impacts caused by development. The residents were asked to express their opinion about new development in the town, about how and where this development should be directed and what resources should be protected. Higher sensitivity and desire to preserve is found in people with a greater sense of belonging and identification with the place. The authors suggest that

planners should understand this relationship as they design and implement conservation policies that consider the needs and preferences of the community.

Lokocz et al. (2011) carried out a similar study in a rural part of Massachusetts that is undergoing transformation as suburban development expands into and replaces farmland. Lokoz et al. wanted to understand how the residents' sense of attachment to the rural environment affects their willingness to support conservation policies and how the transformation of rural areas into suburban areas affects their sense of attachment to place. The study area includes several towns in the Berkshire Mountains, with a focus on the town of Conway. The study found that Conway inhabitants are very attached to the rural qualities of their town and preserving rurality is very important to them. Long-time residents also stated that they had witnessed great changes in the town due to the construction of new homes that have reduced the rural character of the region, a character which was produced by both cultural and natural features. Cultural factors include the historical built environment, of which the town library, a historic covered bridge, old cemeteries, and a prominent church are few examples. The rural character is also formed by forests with large trees, wild animals, and particular characteristics of the soil; though many of these elements were severely altered during European settlement and resource exploitation in the nineteenth century, they have increased in area and age since agricultural pressures diminished in the twentieth century (Foster and Motzkin 1998). Results show that in general the residents are very willing to conserve the environment, especially natural (rivers, lakes, woods and open spaces) and cultural landscapes (villages, small houses and narrow streets) and limit development in rural areas. The population is, in fact, willing to pay to protect the land, including accepting higher taxes; the sense of attachment to the place is therefore a motivation that influences the propensity of the population to undertake conservation activities.

The "Room for River" project is an example of how the strong bond with a place can promote risk reduction strategies. "Room for River," developed in the Netherlands, has the goal of creating more space for occasional water storage, including constructing side channels. These measures go hand in hand with the restoration of rivers and nature conservation. The work of de Groot (2012) demonstrates how attachment to the river relates to the public perception of flood risk management. The area of study includes two major West European rivers, the Rhine and the Loire, which flow through Germany, the Netherlands, and France. People are asked to respond to written questions about various topics including flood risk management policies, and are asked to compare two approaches to the flooding problem: increasing the lateral space that rivers can occupy during floods (the approach advocated for by Room for River), and increasing the river banks' height. They are also asked about their sense of attachment to their place (investigated as identity, connection, and dependence on place). The flood risk management strategy based on the approach of Room for River is more widely accepted than the purely engineering approach of raising river banks. In addition, respondents in favour of the sustainable management of rivers have been shown to have greater sensitivity to nature, recognizing human systems to be integral parts of nature and taking an

active role in environmental management. This suggests that risk reduction activities may effectively be integrated with efforts to maintain natural landscapes, including collaboration between experts and citizens in the development of protective measures, values, and relationships between human communities and nature.

The Province of Potenza, Basilicata Region, is an Italian territory affected by all the major natural hazards that can create significant impacts on affected communities (Attolico 2014). Basilicata Region has been repeatedly hit by heavy rainfall and, although the measures implemented as a result of an extreme event are generally effective, much more needs to be done in terms of prevention and the reduction of impacts. The use and indiscriminate consumption of the natural resources of the region are contributing to increased risk in the area. To try to mitigate these risks, the Province of Potenza has introduced the concepts of Disaster Risk Reduction and resilience in urban and regional land use plans. To implement these two concepts, it is necessary to put in place a process to engage and educate authorities and citizens, building on the emotional drive that encourages the community to preserve the land for economic but also social, environmental, and cultural reasons. These reasons are included in the plans as integral tools of the local planning process, presenting a new model of interaction with the territory, *"a new way of living in urban/territorial context"* based on better use and government of the territory that combines sustainable development and safety. This approach is based on the use of structural and non-structural actions to be applied at different levels (from the local to the larger regional level), in order to reduce the exposure of people and goods to risks and reduce vulnerability. The innovative aspect of the Province of Potenza plan is involving not only the public and private sectors but also individual citizens in the process of resilience building.

Halfway around the world, Hong Kong offers an interesting example of the integration of urban environmental aesthetics and risk reduction as a strategy in response to the conflict between the conservation of green spaces and urban development. The presence of stonewall trees (trees grown in the stone walls built between 1800 and the beginning of World War II in order to stabilize the slopes against landslides in the city) are an example how nature and culture can be harmoniously inserted into the urban context. The development of the city threatens the preservation of such structures, to which the population shows a strong link (Lo and Jim 2010). To date, the development of the city is run by the central government and the population is not sufficiently involved in urban planning. Lo and Jim (2015) seek to understand the attitude of the population towards the stonewall trees and to the changes brought by development taking place in the official plans and in management practices. The study is aimed at the local population and visitors to public parks where these trees are present to evaluate the difference in the degree of attachment to stonewall trees with locals and tourists. The parameters analysed include the perceived intrinsic value of the trees and the need to protect them, the benefits that can be derived from the presence of trees (cool environment, wind damping), emotional responses, interest in local history, familiarity, and social relations. Residents recognize the aesthetic and historic value of the trees and are alarmed by the damage that urbanization could create, and so recognize their responsibility in the trees' protection. The

uniqueness and importance of the natural environment in Hong Kong is also highlighted by non-residents' positive perceptions of the landscape. Tourists with a strong sense of attachment to the community show an attitude of solidarity with the people of Hong Kong, expressing their approval for the conservation of the urban and natural landscape. Trees and vegetation taken root on these dry walls, thus, in addition to their functional role in stabilizing the slope, have a cultural and aesthetic value, and are recognized by residents and others as a symbol of the naturalness of the city.

Post-disaster reconstruction may be an occasion in which to integrate aesthetics with disaster risk reduction. During a catastrophic event, the emotional sphere has an even greater value and people's expressed desires to return to everyday life can indicate which environments individuals feel the strongest relationship with. For this reason, different communities have different perceptions about the same landscape and its possibilities of restoration. Emotion-regulation can be used as a link to join the place identity concept with the restoration of the environment (Korpela and Hartig 1996). Islas and Felsenhardt Rosen (2015) study the way people identify the significance of a certain place. The study is conducted in the city of Valdivia, Chile, in an emergency scenario as a result of an earthquake, and is based on Personal Construct Theory developed by Kelly (1991), according to which humans create a series of characteristics in order to understand their environment and make sense of the stimuli to which they are subjected. Residents are asked to take part in interviews with the aim of identifying the urban areas most used by individuals and the community during the post-emergency period. According to the findings from the study, for post-disaster planning of the city of Valdivia it is necessary to provide access to waterways that allow a steady supply of water, to green spaces, and to constructed elements with historical value. Consequently, in the post-disaster reconstruction designers must plan to protect these elements against drastic action that might totally change the urban environment. It also suggests that emotional attachments to the landscape should be considered in restoration plans following a disaster. Landscape beautification, in fact, can help people to recover more quickly, from a psychological point of view, through the restoration of natural elements. The link between urban planning and emotions assumes even greater value in terms of strength and resilience: the presence of natural environments in the city's design may provide the ability to adapt to the occurrence of an event, without profoundly changing the physical characteristics of the environment. The maintenance of the natural characteristics of the city also has a redundancy effect useful for the city itself and the surrounding cities, which can benefit from the services offered by these natural spaces in urban settings if affected by a disaster in turn. Villagra Islas and Felsenhardt Rosen insist on the need to insert in urban development plans tools and guidelines to enable the cities affected by a disaster to be resilient.

The reconstruction project "Borghi Attivi – Statuto Partecipato dei Paesi d'Italia" (Active Villages – Participated Statute of Italian Villages), defined after the earthquake in L'Aquila (Abruzzo, Italy) in 2009, is another example of how environmental aesthetics can be a guideline for the recovery of an entire suburban area. The project is inspired by the English "Village Design Statement" (VDS), which aims at

developing an urban planning tool that preserves the rural character of landscapes and improves their environmental quality. The post-earthquake reconstruction in L'Aquila entailed the creation of new residential areas, completely dissociated from their existing context before the earthquake, in the so-called "New Town," and people started to feel almost strangers in their own house. In response, the "Borghi Attivi" projects seeks to define a participatory reconstruction path, through suggestions from citizens, to ensure that the unique characteristics of the area will be considered, preserved and enhanced in future urban planning. The ultimate goal is to incorporate a collection of the particularities and distinguishing features of each village and its people in an "Atlas of Places," which will be the basis for the drafting of the "Statute of Places." The project started in 2011 and ended in December 2012 and was extended to five rural communities affected by the earthquake of 2009, located in three of the four provinces of Region Abruzzo: Tione degli Abruzzi, Fontecchio, and Pescomaggiore, in L'Aquila province; Civitella Casanova in Pescara province; and Fano Adriano in Teramo province. The aesthetic enhancement of the landscape is a central and common element of the guidelines of the five villages involved in the project. The main guideline identified by the citizens is aimed to recover and improve the historical town centres. In particular, in Fano Adriano, Pescomaggiore and Tione degli Abruzzi, aesthetics played an important role in the reconstruction of the villages. The inhabitants encouraged a reconstruction that includes the maintenance of historical aspects of their towns through the indication of the materials and design that every building should have (doors, railings, windows, gardens, roofs and gates). Another guideline focused on the recovery and reuse of historic homes and old shops and small coffee shops, both in the city centre and in the suburbs. The rural landscape had a central role in defining the local identity, which would also support economic recovery, including the return of the tourist industry. Examples are the small stone huts in Pescomaggiore and dry stone walls in Fanon Adriano and Fontecchio. In Civitella Casanova places of worship have been defined as representative elements of the local identity to be protected. The "Statute of Places" compiled in each village has been adopted by the local governments as a guideline for the revival of the five communities.

Another example of the integration of local conceptions of beauty, place attachment, and risk reduction is a master plan for a small town in southern Vermont created by students at the Conway School, a graduate program in sustainable landscape planning and design in Massachusetts (Lague and Smith 2013). In August 2011, Tropical Storm Irene inundated the town of Wilmington (population 2300). The Deerfield River rose 27 ft, destroyed many buildings in the village center, and took one life. The town relies on tourist dollars—skiers and second-home-owners pass through the town on their way elsewhere—and sought the help of the school to create a master plan for a vibrant, revitalized downtown. At the beginning of the design process, the town's government representatives, and many residents, believed the project would focus on simply restoring and beautifying the downtown.

LaGue and Smith conducted analyses of environmental, social, and economic conditions. The village is in a mountainous region with steep and rocky landscape. Water runs off quickly and in large volumes during storms, particularly during the

spring thaw. The village center is at the confluence of the Deerfield River and Beaver Brook and sits largely within the 100-year floodplain. Many buildings in the floodplain (and many of the town's historical structures) have been destroyed or sit partially or fully vacant. The students, in consultation with community members, made a number of recommendations: within the floodplain, they recommended creating flood-appropriate public spaces, reducing impervious surfaces, and increasing stormwater storage capacity; throughout the town, they made the case for new zoning regulations that would encourage dense development to take place, over time, outside the floodplain in an area near the current village center but well outside the 500-year flood zone. Using various criteria developed with the help of the community, the students identified a location for this future village center. They created a master plan that illustrated how such a future center could evolve over time to become a "traditional" New England village: walkable, with a diversity of housing types, attractive to residents and visitors alike. Here, as in many projects in rural and suburbanizing New England (like Monmouth, Maine), planners must use language, concepts, and images that are consistent with how the community envisions itself and its future. This involves engaging in an aesthetic conversation (though it is rarely discussed in those terms), as residents struggle to come to an agreement about their various, multiple understandings of what constitutes the good life, where "good" takes on both aesthetic and ethical meanings. In Joan Nassauer's terms, it is essential to be attentive to *cultural* sustainability, to frame ecologically healthy environments in terms that are familiar and acceptable to human communities: "Landscapes that evoke the sustained attention of people—that compel aesthetic experience—are more likely to be ecologically maintained in a world dominated by humans" (Nassauer 1997, 81).

In another Conway project, students concluded that a coastal town rapidly suburbanizing, where residents were concerned about losing beloved farmland and woods, should consider directing residential and commercial development to an already developed downtown neighborhood—well outside the area projected to be at risk of floods and storm surges as climate changes take effect. If the students talked about "dense development" and "urban form," residents would have rejected their recommendations because the language did not reflect their visions of their landscape, or community. However, when framed as "traditional New England village design" that would create a pedestrian-friendly center where residents who wanted to age in the town, near friends and family, rather than move elsewhere, or where the young people of the town could afford to rent small apartments downtown rather than move to the city, the recommendations became acceptable. In addition, by directing development to such an area, the town could still grow without destroying its farms and forests. Such a strategy was consistent with Nassauer's conclusion that "Policies and strategies, landscapes and technologies should be designed to align aesthetic expectations with ecological health" (82).

Conclusions

Decisions to transform environments, if not integrated into the social and emotional characteristics of the community, may produce comfortable and beautiful landscapes, but potentially dangerous ones. The territory and its natural resources are not raw material to catalogue and manage as a commodity, but are "places with a story, which people take care of and with whom they develop a sense of belonging" (Williams and Patterson 1996). Environmental aesthetics principles should be integrated with ecology and nature conservation (Nohl 1997), and our understanding of the landscape as a common good should be further developed. The changed perception of the role of *Homo sapiens* in the terrestrial ecosystem is central in the debate on environmental and climate change and has brought greater awareness of hazards, risks, and human responsibility in disasters. However, prevention, mitigation, and adaptation activities to reduce disaster impacts are still meagre. The unpredictability of certain extreme natural events (due to our incomplete knowledge of such processes) makes it difficult to justify the costs of prevention and mitigation. Thus, incentives through which we justify and make more acceptable such costs must be devised; possibly blending disaster risk reduction into environmental aesthetics and ethics may provide such allure.

The political sphere should encourage activities to "beautify security" in order to build the safe communities. Security should not be subject to changes depending on the political force in office (both at local and at central scale) but should be guaranteed in any case. Similarly, improving security is also a duty of each citizen and we need to define criteria by which such a right and duty can be expressed. Public debate should play a central role in this discussion. At present, public meetings during which a project is introduced to the community and stakeholders, and opponents and supporters of the project discuss alternatives can be extended beyond landscape beautification to introduce and link disaster risk reduction to the restoration of the landscape for mitigation or reconstruction after a disaster.

At the legislative level, lawmakers should review regulations and codes that guide the reconstruction of historical settlements, especially those that are extremely fragile as a direct consequence of the very elements that constitute their beauty (e.g., their materials and building techniques). The combination of sustainable landscape design and disaster risk reduction can help support communities to take care of their territories in a sustainable, safe and pleasing way. Historical villages and cities could develop in a sort of open-air laboratory and show that an equilibrium between beauty and safety can be reached, demonstrating that is possible to move from an old and catastrophic vision of extreme natural events to one of coexistence and resilience to natural processes.

At present, resources are spent more easily to beautify the landscape rather than to make it more stable and secure. The challenge is, therefore, to insert risk reduction in the environmental aesthetic discourse and vice versa. It can be argued that this is not a new idea. After the earthquake that destroyed Noto Valley in 1693,

Sicily undertook a process of reconfiguring its urban spaces to make them beautiful, useful, and seismically safer.

As with the quest for good and healthy food, perhaps we should pursue "beautified safety" models that, besides safeguarding landscapes from disaster risk, also makes them beautiful.

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Fausto Marincioni is associate professor at the Università Politecnica delle Marche at Ancona (Italy), where he teaches and carries out research on disaster risk reduction. He holds a Ph.D. in geography from the University of Massachusetts and is an editor of the International Journal of Disaster Risk Reduction.

Cristina Casareale is a Ph.D. candidate in Civil and Environmental Protection at the Univeristà Politecnica delle Marche (Ancona, Italy). She holds a BSc and a M.Sc. in Environmental Sciences and Civil Protection from the same university. She is conducting research on maritime disasters in collaboration with the Disaster Research Center (DRC) at the University of Delaware and with the Science of Networks in Communities Research Group (SONIC), at Northwestern University.

Kenneth Byrne is co-director and professor at the Conway School, a cooperatively run independent graduate program in ecological planning and design in Northampton, Massachusetts. He has written about climate change, alternative economics, schooling, and disasters; his environmental detective novel Exile Woods is forthcoming.