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## The Watershed Approach: Challenges, Antecedents, and the Transition from Technical Tool to Governance Unit

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**ABSTRACT:** Watersheds are a widely accepted scale for water governance activities. This paper makes three contributions to current understandings of watersheds as governance units. First, the paper collects recent research identifying some of the challenges associated with the policy framework understood as the watershed approach. These challenges are boundary choice, accountability, public participation, and watersheds' asymmetries with 'problem-sheds' and 'policy-sheds'. Second, the paper draws upon this synthesis and on a review of the development and evolution of the concept of watersheds to suggest that the challenges associated with the watershed approach are symptoms of a broader issue: that the concept of watersheds was developed as a technical tool but has been taken up as a policy framework. The result of this transition from tool to framework, the paper argues, has been the conflation of governance tools, hydrologic boundaries, and Integrated Water Resources Management (IWRM). Third, the paper calls for an analysis of watersheds as separate from the governance tools with which they have been conflated, and presents three entry points into such an analysis.

**KEYWORDS:** Watershed, governance, boundary, IWRM, decision-making, scale

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### INTRODUCTION

This paper addresses the 'watershed approach' to water governance – that is, policy frameworks using watersheds as governance units.<sup>1</sup> Watersheds, defined as areas of land draining into a common body of water (USEPA, 2008a), are a popular scale for water governance initiatives (Baril et al., 2006; Koehler and Koontz, 2008). Although proponents have touted the advantages of using watershed boundaries over their jurisdictional predecessors (e.g. Mitchell, 1990a; Montgomery et al., 1995; McGinnis, 1999), a number of more recent papers have questioned the benefits of this approach to water governance and have identified significant challenges with its implementation (e.g. Griffin, 1999; Fischhendler and Feitelson, 2005; Draper, 2007; Ferreyra and Kreutzwiser, 2007; Warner et al., 2008; Norman and Bakker, 2009). The emerging debate has typically focused on specific elements of the watershed approach, particularly participation and accountability. This paper broadens the debate by examining themes within the challenges associated with the use of watershed boundaries and seeking to

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<sup>1</sup> We use the term 'watershed' to denote a hydrologically defined unit: an area of land draining into a common body of water such as a lake, river, or ocean. 'Watershed' is the most common North American term for such a unit, but these are also labelled variously as 'river basins' and 'catchments' throughout the world. For ease of terminology, we use the term 'watershed' throughout this paper.

understand these in light of the emergence and evolution of the concept of watersheds.<sup>2</sup> In so doing, the paper argues that the recognised challenges associated with a watershed approach are symptoms of the conflation of watersheds with other governance tools such as integration and public participation, as well as a conflation of watersheds with Integrated Water Resources Management (IWRM).

The first part of the paper outlines five recognised challenges associated with the watershed approach: the challenges of boundary choice, accountability, public participation, and asymmetries with 'problem-sheds' and 'policy-sheds'. The second part of the paper traces the development and evolution of the watershed concept: its grounding in hydrology and scientism, and the expansion to its use as a policy framework. This evolution highlights the disjuncture between the development of the watershed as a technical tool and its uptake as a governance unit – a disjuncture which has led to a conflation of watersheds with other governance tools as well as with IWRM. In particular, the conceptual jump from technical tool to governance unit was made without an attendant focus on the broader components of water governance; the paper suggests that the effects of this jump are the challenges that have arisen with the increasingly popular watershed approach. Finally, the third section of the paper speaks to the implications of this argument by calling for an analysis of watersheds in and of themselves. Examining watersheds as separate from IWRM and as separate from the suite of governance tools they have come to represent would allow for inquiry into questions that speak to some of the challenges. When, for example, are watersheds useful or appropriate scales to use, and when might other scales (e.g. municipalities or regions) be a better fit? What kinds of decisions are best made at the watershed scale and what kinds of decisions are best made elsewhere? Inquiry into these kinds of questions would be helpful to water managers and environmental scholars seeking to better understand the implications of this popular governance scale.

## THE CHALLENGES

### Boundary choice

A first challenge relates to the complex nature of boundary definition: even when the surface hydrology is clear (which is not always the case), the choice about which boundary to use is often not.

Although the commonly used definition of a watershed as "an area of land draining into a common body of water" is clear and hydrologically based, it does not offer any guidance with respect to which watershed boundary is most useful for the purposes of governance or management. Using this basic definition, a watershed could be as small as a sidewalk puddle or as large as the Great Lakes – St. Lawrence basin. These infinitely nested watershed boundaries are often incongruent with other natural systems boundaries (Griffin, 1999), such as ecosystems (Omernik and Bailey, 1997; Mollinga et al., 2007), airsheds (Jaworski et al., 1997; Paerl et al., 2002), and groundwater flow (Winter et al., 2003). Moreover, hydrologic boundaries are constantly shifting as our understanding of surface water and groundwater flow and GIS technology become increasingly sophisticated. As a result of these hydrologic choices and changing information, choosing *which* watershed boundary to use is often a political act as much as it is a scientific one (Blomquist and Schlager, 2005). Indeed, the nested nature of watersheds (and sub-watersheds and tributaries) lends itself to a number of different boundary options, and decisions about which hydrologic boundary (or boundaries) to use for the purposes of governance or management can be based on a combination of natural and social factors. The existence of these choices complicates a decision that is purported to be a simple and purely scientific one.

The province of Québec, Canada, provides an example of the complicated nature of boundary drawing. Québec's 2009 *Act to Affirm the Collective Nature of Water Resources and Provide for*

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<sup>2</sup> For a comprehensive review of the concept of hydrologically defined governance units, see Molle, 2009.

*Increased Water Resource Protection* (R.S.Q. c. C-6.2) outlines the parameters for the province's creation of watershed-based governance entities. The *Act* states,

the Minister of Sustainable Development, Environment and Parks may identify and describe hydrologic units, including watersheds, sub watersheds, and groups of watersheds... on the basis of such criteria as a) the area of hydrologic units, b) the territorial limits of Québec, the administrative regions or the regional county municipalities, as the case may be, c) the population density, d) the past cooperation, cohesion and harmony between the various users and stakeholders; and e) the environmental, social and economic homogeneity of development activities (s. 14(2)).

This example shows how hydrologic and other factors (e.g. groundwater and surface water flows, political boundaries, population density) can complicate a seemingly straightforward mapping exercise.

### **Accountability**

Ensuring the accountability of watershed-scale decisions and decision-making bodies is a second challenge. Because watersheds are generally not aligned with conventional electoral boundaries – for example, municipal, provincial, state, or national boundaries – the usual pathways of electoral accountability do not necessarily apply, giving rise to concerns that watershed-scale organisations may not display answerability or responsiveness to those living and working within the watershed (Blomquist and Schlager, 2005). Indeed, governmental participants in watershed-scale initiatives are ultimately responsible for, and accountable to, the jurisdictions in which they were elected or for which they are responsible (Salles and Zelem, 1998); more often than not, this latter scale does not align with watershed boundaries. Sneddon (2002), for example, discusses the tensions between local and state actors engaged in the co-management of the Nam Phong basin in Thailand, arguing that government participants in such processes respond primarily to those scales with which they most relate; in this case, their jurisdictionally defined electorate, rather than the watershed.

Outside of elected officials, the challenges surrounding accountability speak to the question of delegating decision-making authority to non-elected parties, as a watershed approach typically includes extra-governmental participation. Accountability concerns – particularly with respect to extra-governmental participation in decision-making processes – are often related to the broader question of legitimacy. The conceptual shift from legitimacy as representation to legitimacy as participation was prompted in response to a community of scholars (e.g. Pateman, 1970; Habermas, 1973) who, in the early 1970s, "launched a frontal attack on the dominant conceptions of liberal democratic theory", arguing that democracy had not only failed to live up to its promise, but has "led to elitist policies that have benefits for only the few" (Fischer, 1993). True democracy, so went the argument, must include decisions made not by government officials or technical experts, but by the citizens affected by those decisions (i.e. the public). This conceptual shift prompted the relabeling of legitimate decisions as those that were made by the people (Scharpf, 1999) through participatory processes, rather than those made through traditional decision-making channels by elected representatives.

In the case of the watershed approach, the accountability challenge can be seen as a function of the process through, and the degree to which, participants and stakeholders have been involved in the decision-making process. The boundary asymmetries between watersheds and municipal, provincial, state, and national electoral scales compound the challenges associated with the multi-stakeholder, participatory styles of decision-making that are, increasingly, seen as prerequisites for legitimacy and accountability.

### **Public participation and empowerment**

Public participation presents a third challenge. Arguments about the benefits of the inclusion and empowerment of local actors in environmental decision-making are often promulgated through arguments in favour of decentralised decision-making.

The watershed approach represents both a scaling up from municipalities and a scaling down from nations, states and provinces, but the move has largely been framed as one of decentralisation (e.g. Kemper et al., 2007; Iza and Stein, 2009). Frequently-cited benefits of decentralisation include: increased proximity between decision-makers and those affected by governance decisions, an increase in sub-national level democratic participation, greater access to local knowledge and expertise, heightened responsiveness to citizen needs and concerns, and empowerment of local communities (Gibbins, 2001; Paehlke, 2001; Lemos and Agrawal, 2006; Rabe, 2006; Hill et al., 2008).

The benefits of increased extra-governmental involvement and lower governance levels' potential to harness local expertise have gained particular traction in government and have been the subject of much research (e.g. Duram and Brown, 1999; Wester et al., 2003; Sabatier et al., 2005). Norman and Bakker (2009) suggest that this preference for local water initiatives may stem from what Brown and Purcell (2005) call the 'local trap', wherein it is assumed that "organization, policies, and action at the local scale are inherently more likely to have desired social and ecological effects than activities organized at other scales". However, recent research suggests that re-scaling initiatives may fail to meet participation and empowerment expectations. Norman and Bakker (2009), for example, show that despite significant re-scaling of Canada-US transboundary water governance, higher orders of government have not loosened their grip on their decision-making power and local groups have not been empowered through the devolution process. This phenomenon is characteristic of what Fischer (2000) describes as the "discrepancy between the responsibilities people are given and the rights and powers they have, including the power to act on their responsibilities". Indeed, Warner (2007) notes with respect to the case of participatory watershed governance:

One important political reality is that states do not much like sharing power. For all the sea changes in public management in response to state overload and policy failures – working with societal actors, network management in which the state is a *primus inter paris* – many states are still not relinquishing much of their power primacy.<sup>3</sup>

Re-scaling to the watershed then, does not in and of itself empower local or non-governmental actors, and there does not appear to be anything inherently participatory or empowering about re-scaling.

### **Asymmetry between watersheds and 'problem-sheds'**

A problem-shed, defined as a "geographic area that is large enough to encompass the issues but small enough to make implementation feasible" (Griffin, 1999) introduces a fourth challenge: watersheds frequently impact – and are impacted by – factors outside of their boundaries. In other words, watershed boundaries (or, for that matter, any other boundaries) rarely encompass all of the physical, social, or economic factors impacting upon the area within its borders.

Physically, a watershed may be impacted by a number of factors, many of which may originate outside of the watershed. For example, zebra mussels, introduced through ship ballast water to the Great Lakes, are an invasive species estimated to have cost the North American economy more than \$100 million. They have also wreaked havoc on the natural ecosystem, causing the near death of some food webs, and encouraging others to grow out of control (Strayer, 2009).

The problem-shed challenge applies to social issues as well. For example, individuals may not relate to or identify with a watershed boundary (Brun and Lasserre, 2006). Grigg (2008) argues that the watershed approach presents false boundaries for decision-making since watersheds are essentially non-economic or social units. Similarly, Ferreyra et al. (2008) demonstrate a disjointed and incompatible relationship between rural farming and source water protection efforts in rural Ontario,

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<sup>3</sup> Although governments keeping control may well be a function of their dislike for shared power, it may also be a function of the legal impossibility of abdicating their constitutionally prescribed roles. The point here is that while governments may be inclined to devolve responsibility, they are often either unable or unwilling to undertake a concomitant devolution of authority.

Canada. In this case, source water protection activities required farmers to associate and plan their activities based on the needs of their watershed, but farmers were more often drawn to the needs of the economic commodity chain related to their farming business.

These examples of asymmetries show that watersheds affect – and are affected by – physical, economic and social phenomena that extend beyond their boundaries. Moreover, recent research into these boundary asymmetries suggests that the curtaining off of watersheds from their surrounding physical, social, and economic *milieus* may generate new challenges (Cumming et al., 2006).

### **Asymmetry between watersheds and 'policy-sheds'**

Unless all policy is made at a watershed scale (which is unrealistic, given international relations, transit within and between countries and regions, etc), no single set of policies will ever wholly encompass the watershed. This is problematic in two ways. First, the asymmetry can lead to gaps and overlaps in legislation to be implemented by the watersheds' municipalities and regional governments. Second, it is hydrologically problematic: if policy cannot be made at a watershed scale, the hydrologic arguments for watersheds seem moot. Or, if policy *can* be made at a watershed scale (i.e. if there is legislation empowering them to do so), it can be stymied by the accountability challenge or by the administrative obstacles posed by coordinating with the other jurisdictions within its purview.

We define a policy-shed as a geographic area over which a governmental entity has legislative authority, such as a nation, state, province, county, or municipality. Like the accountability challenge, this challenge results from asymmetries between watershed boundaries and conventional administrative scales (i.e. policy-sheds). These asymmetries can be compounded by policy gaps and overlaps between the different policy-sheds themselves. In some cases, multiple policy programmes will exist both within (frequently in a piecemeal fashion) and beyond the watershed. Or, put another way, "regional, provincial, federal, and international bodies may have different authorities in a given watershed" (Hoover et al., 2007). This scalar mismatch results in policy implementation occurring in a largely fragmented and uncoordinated manner (Schlager and Blomquist, 2000). In addition to the difficulties associated with the implementation of overlapping and potentially competing legislation, asymmetries between watersheds and policy-sheds can complicate data collection and monitoring. A multiplicity of jurisdictional governments provides ample opportunity for turf-wars or, conversely, buck-passing, both of which can hinder the ability of a watershed-scale authority (if such a group exists) to effectively collect data and monitor on a watershed basis.

Examples of the boundary asymmetries between watersheds and policy-sheds abound, particularly in fragmented, federated states like Canada. Environmental protection north of Toronto, Canada, provides an example of this phenomenon. In this case, the provincial government of Ontario moved to protect areas north of Canada's largest city through three pieces of legislation, the geographical scope of which overlap considerably. At present, three different pieces of legislation exist on a common geography: *The Oak Ridges Moraine Conservation plan* (2002, O. Reg 140/02), the *Greenbelt Act* (2005, S.O. 2005, c. 1), and, most recently, *the Lake Simcoe Protection Act* (2008, S.O. 2008, c. 23). Together, these pieces of legislation create a fragmented and patchwork policy landscape to which municipal and provincial governments must try to adhere.

### **LOST IN TRANSLATION: WATERSHEDS AS TOOLS AND FRAMEWORKS**

The challenges noted above present significant obstacles for water governance. Efforts to tackle these challenges would involve altering boundaries for each problem in an attempt to obtain an accountable, participatory system that integrates the factors within and outside of a given watershed's boundaries and coordinating these with existing governmental and non-governmental institutional boundaries. Governance at any scale – including the watershed – involves trade-offs between these factors. To assume that watersheds are somehow exempt from these trade-offs is perhaps unrealistic; as Lane et

al. (2009) note, "rescaling governance and management is no panacea for the 'wicked' problems of institutional complexity and fragmentation". Or, as Brun (2009) notes, "management on a watershed basis is not a miracle solution".<sup>4</sup> Moreover, the challenges described above are some of the very problems that watershed-based governance models were designed to solve, but instead have perpetuated. This is not to say there is no use for the watershed boundary; there are many situations where watersheds can be extremely useful tools. However, the challenges do prompt interesting questions about how and when to use a watershed boundary. For example, what decisions are best made at the watershed scale and what kinds of decisions might best be made elsewhere? What are the relationships between watersheds and the tools and frameworks with which they have become conflated? This paper does not attempt to provide a full resolution to these questions, but puts forth some potential paths of analysis that may prove fruitful.

### **Development and evolution of the watershed concept**

Addressing the above questions requires inquiry beyond current water governance debates and into the development and evolution of watershed boundaries. This line of investigation is a nonlinear one, because the concept of watershed boundaries veers in, out, and across multiple water dialogues.<sup>5</sup> While the uptake of the watershed as a governance unit is a relatively new phenomenon, recognition of the utility of the hydrologic boundary is not. Some evidence exists of watershed mapping extending as far back as the third century BCE China (Molle, 2009) and drainage areas were mapped in Spain and France in the mid-1800s (Blomquist and Schlager, 2005; Molle, 2009). By the 20th century, managing water within hydrologic boundaries had become increasingly common.<sup>6</sup> Up to this point, the use of hydrologic boundaries was primarily driven by expertise in hydrology and engineering, with an emphasis on efforts towards flood control, irrigation and drainage, and power (Cervoni et al., 2008). In the 1950s, the incorporation of human use and the distribution of costs and benefits into this hydrologic model (Molle, 2009) led to a reframing of the dominant water management paradigm, which was coined as Integrated Water Resources Management (IWRM) in the 1950s (White, 1957). The reinvention and re-emergence of IWRM in the early 1990s<sup>7</sup> included a broadened scope to include both natural and human components (Jønch-Clausen and Fugl, 2001), largely due to the increasing recognition of the need to integrate economic, social, and natural resources under a single framework (GWP, 2000).

Some scholars have argued that the focus on IWRM in the 1990s did not introduce a new concept, but was rather "the rediscovery of a basically more than 60 year old concept" (Biswas, 2004). Nevertheless, the 1990s saw the 'new' IWRM become increasingly mainstream through its adoption into international water dialogues (Rahaman and Varis, 2005; Warner et al., 2008) and government planning (McGinnis, 1999; Leach and Pelkey, 2001). IWRM reached such widespread acceptance that it was suggested it had become the "orthodoxy of water resources management" (Jeffrey and Gearey, 2006), part of the "holy trinity of water governance" (Warner et al., 2008) (which also includes river basin planning and multi-stakeholder platforms), and that it "enjoyed a 'near hegemony' as the language of international water policy" (Conca, 2006).<sup>8</sup> Through all of these transitions, proponents of IWRM maintained that watershed boundaries were the scale at which IWRM should ideally be implemented (Jønch-Clausen and Fugl, 2001; Jeffrey and Gearey, 2006; Cervoni et al., 2008). The 'old'

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<sup>4</sup> Translation by Alice Cohen. Original in French reads "La gestion par bassin n'est cependant pas une solution miracle".

<sup>5</sup> An extensive history of the concept and implementation of watersheds is beyond the scope of this document. For a richer discussion, see White, 1998; Mitchell, 2005; Varis and Rahaman, 2005; Molle, 2009.

<sup>6</sup> The Tennessee Valley Authority in the 1930s and the establishment of Conservation Authorities in Ontario (Canada) in 1946 are examples of the early use of hydrologic boundaries.

<sup>7</sup> This re-emergence stemmed, in large part, from international dialogues at Mar del Plata (1977), Bonn (2001), and Johannesburg (2002) (Iza and Stein, 2009).

<sup>8</sup> For a more detailed discussion of the rise of IWRM through expert networks, see chapter 5 of Ken Conca's *Governing Water: Contentious Transnational Politics and Global Institution Building* (2006).

watershed idea was thus reinvigorated through its suffusion into IWRM (Molle, 2009) as IWRM became increasingly popular.

### **Between science and policy: From watersheds as tools to watersheds as frameworks**

At this point, the watershed narrative takes a twist: watersheds expanded from a mapping and planning tool to a governance framework. The adoption of international IWRM water dialogues by regional, national, and sub-national government agencies and water policy planners appears to have been fixated on watershed boundaries. Rather than as an arm of IWRM or a technical tool (as framed by IWRM's antecedents), watersheds were recast as frameworks; the watershed approach became an umbrella under which other features of IWRM, such as participation and integration, fell. The United States Environmental Protection Agency (USEPA), for example, defines a watershed approach as one that is hydrologically defined, includes all stakeholders, and "strategically addresses priority water resource goals" (USEPA, 2008b).<sup>9</sup> The USEPA framing exemplifies the chasm that formed between the way in which watersheds were framed by IWRM and its antecedents and the way(s) they were reframed by implementing organisations as watersheds moved from their conceptualisation as a technical or planning tool to being conceptualised as a policy framework in the form of the new watershed approach.

A thorough examination and understanding of this conceptual slippage is outside the scope of this paper, but one element of watersheds' uptake bears particular mention here. The concept of watersheds as tools emerged in the context of 19th century scientism (Molle, 2009; Saravanan et al., 2009), during the rise of hydrological sciences (Linton, 2008) and the triumphs of hydraulic regimes and high modernism. These technical origins and focus may have obscured, or at least drawn attention away from, the procedural or governance components of this 'new' watershed approach. It is thus perhaps more than coincidental that the foundations of the watershed approach are technical and its core challenges are not. In other words, the challenges identified here can be seen as symptoms of watersheds' jump from a predominantly technical tool to a governance framework within the water landscape. As the concept of watershed boundaries was adopted into water governance efforts, this technical tool – which was not designed to address the broader components of water governance – became a governance unit, but without an attendant focus on the governance or procedural elements of the new watershed approach. The effects of this slip from technical tool to governance framework can be seen in the commonalities between the challenges identified in the first part of the paper.

The challenges of boundary choice, accountability, participation, and the asymmetries between watersheds, problem-sheds and policy-sheds are challenges of governance; they are not scientific or technical challenges relating to issues such as the need for more data or better instrumentation. Though not unwelcome, enhanced monitoring, mapping, or data do not address the roots of the challenges associated with watershed-based governance approaches, all of which relate to social, political, and economic decision-making, but have come to be associated with a hydrologic boundary. Air-sheds' influence on watersheds, for instance, can be framed as a challenge with the watershed approach, but might be usefully re-framed as a governance challenge resulting from affording primacy to one governance unit over another.

Understanding how governance decisions came to be associated with a specific hydrologic boundary involves an understanding of the appeal of watersheds – an appeal which draws in large part on the units' supposed naturalness (Mitchell, 1990b; Montgomery et al., 1995). As Brown and Purcell (2005) note, "there's nothing inherent about scale". In this case, the authors were speaking to assumptions embedded in political ecologists' preference for 'the local'. In the case of watersheds, these inherent

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<sup>9</sup> The USEPA is only one of many examples of this phenomenon. Borre et al. (2001), for example conceptualise a 'watershed approach' as one that includes citizen and stakeholder involvement, is focused on the geographic area of the watershed, and "promotes cooperation among different jurisdictions and organizations within the watershed". See also Born and Genskow, 2000; Leach et al., 2002; Sabatier et al., 2005, and others.

assumptions include a suite of characteristics that have come to be conflated with watersheds under the rubric of the watershed approach. A brief example may help to illustrate this point. There is nothing inherently participatory about the use of a hydrologic boundary instead of a municipal boundary: one can easily imagine a scenario in which autocratic decisions are made at the watershed scale, or one in which there is rich public discussion at the municipal scale. Yet stakeholder participation has become an axiomatic component of watershed-based governance frameworks (Curtis et al., 2002), to the point where a watershed approach means participation (e.g. Borre et al., 2001; USEPA, 2008b), and the challenges associated with public participation in decision-making are seen as problems associated with a watershed itself (Johnson et al., 2001). The conflation of watersheds with other governance tools is problematic because it complicates an analysis of the watershed itself – an analysis that cannot be undertaken without disentangling the watershed from its associated characteristics.

Discussions of scale in the geography literature can help to inform this disentangling. A central insight of the scalar literature is that scales of governance – e.g. nations, provinces, and municipalities – are socially and politically constructed through discourse, social contestations, and power structures (Delaney and Leitner, 1997; Swyngedouw, 1997, 2004). This constructivist perspective on scale actively decouples geographic space from power, seeing scales not as predetermined administrative units, but as products of boundaries drawn through processes rooted in social power structures. Applied to watersheds, this scalar literature denaturalises the watershed by refuting the dominant discourse of watersheds as "nature's boundaries" (Norman and Bakker, 2009) and therefore as an obvious, indisputable scale at which to undertake governance activities (Allan, 2003; Fischhendler and Feitelson, 2005; Warner et al., 2008). The uptake of watershed boundaries can then be re-framed as a policy choice, rather than as an unquestionable scale at which good water governance must take place; watershed boundaries are recast as tools that can be selected, rather than de facto starting points for water governance initiatives.

### **CALL FOR AN ANALYSIS OF WATERSHEDS AS TOOLS: SOME POSSIBLE STARTING POINTS**

Re-framing the uptake of a watershed boundary as a tool to be selected rather than as an unquestioned starting point allows for a closer examination of watersheds. To date, such an analysis has proven impractical due to the conflation of watersheds with other governance tools, such as participation and integration, as well as the entanglement of watersheds with IWRM. Yet, as this paper suggests, watersheds can, in fact, be disentangled from these other tools, thereby permitting an analysis of the purpose, utility, advantages, and disadvantages of watershed boundaries. Such analysis begets a number of questions. These include: when are watersheds appropriate or useful? What kinds of decisions should be made at the watershed scale, and what kinds of decisions are best made elsewhere? How do IWRM and watersheds relate to one another; can you have one without the other? These possible starting points for analysis are discussed here.

A first line of inquiry into an analysis of watersheds is the question of when watersheds are appropriate or useful. An analogous debate is already underway in the form of a rich discussion on citizen engagement, which has grappled with questions of when, and what kinds of, public participation are best suited to different types of policy decisions (see Wester and Warner, 2002; Irvin and Stansbury, 2004; Koontz and Johnson, 2004). A similar discussion on the topic of when watersheds are and are not useful could be similarly rich, and is long overdue (Warner et al., 2008). As a starting point for discussion, we identify two examples of scenarios where re-scaling to the watershed might be appropriate. The first is the case in which there is an issue that is specific to a particular size of watershed. One example here is the case of Ontario, Canada, in the 1940s, where erosion and flooding were having adverse impacts on property values and agricultural production (Conservation Ontario, 2009). In this case, watershed boundary delineation was informed by flood mapping. Although these boundaries are not ideal for every challenge the province faces (the conservation authorities in the Great Lakes Basin, for example, are governed separately despite the fact that they are all in the same

basin), the initial process of boundary drawing was guided by problem definition. In cases where there is a similarly bounded challenge, clarity about why a particular set of boundaries were chosen may help to avert the challenges of boundary delineation and watershed asymmetries with problem-sheds.

Another scenario in which watershed boundaries may be appropriate is in the case of a jurisdiction-wide policy of re-scaled water governance. We know from the literature on water privatisation that reforms brought in to address particular governance failures are most effective when strong governance mechanisms, such as defined property rights or the capacity for monitoring and enforcement, are already in existence (Challen, 2000; Bakker, 2007). In other words, good governance may be a prerequisite for – rather than an outcome of – governance reform. In the case of watersheds, we draw on work identifying principles of good water governance to speculate that re-scaling is less likely to run up against the challenges identified here if a) the mandates of watershed organisations are clearly defined (thereby clarifying the scope of its 'policy-shed'), b) the scope of their powers and subsequent governance structure are clearly delineated (thus clarifying actors' roles and mitigating some of the accountability challenges), and c) they are properly resourced (e.g. with expertise, equipment, human resources, and money) (Brun, 2009; Nowlan and Bakker, 2010). We contend that watersheds may *not* be appropriate in cases where re-scaling is being undertaken to address persistent governance challenges, such as lack of monitoring and enforcement, without concomitant attention to the underlying sources of the problem; such cases, we suggest, perpetuate rather than solve governance failures. In sum, we suggest two examples of situations in which watersheds might be most appropriate: in cases where there is a hydrologically bounded issue that guides the selection of boundary choice, as well as in cases where the foundations of good water governance are in place in advance of re-scaling.

A second potential line of inquiry concerns what kinds of decisions should be made at the watershed scale, and what kinds of decisions are best made at other governance scales. A comparable discussion can be found in the environmental governance literature on harmonisation and subsidiarity, where debate has taken place with respect to questions about what kinds of environmental decisions might be best suited to which levels of government (e.g. Paehlke, 2001; Rabe, 2006; Hill et al., 2008). Debate on scaling governance that includes an examination of watersheds as governance scales could prove particularly helpful. Two examples may be useful in illustrating this point. In Canada, drinking water guidelines set by the federal government are non-binding because of the separation of powers under the *Constitution Act* (1867, c.3). This means that each province in Canada is responsible for setting its own binding drinking water standards. This approach, and the subsequent inconsistency of drinking water quality across the country, have been the subject of some critique (Hill and Harrison, 2006; Eggertson, 2008; de Loë, 2008; Hill et al., 2008). These critiques suggest that in matters of public health, inconsistency is problematic and thus watersheds are perhaps not the place to make such decisions (they could, however, be tasked with identifying scale-appropriate means to meet a standardised set of ends). The same might be said for environmental water quality, where delegation to lower levels of government in the United States has led to measurable declines in water quality (Sigman, 2005). These two cases suggest that setting quality standards is perhaps best left to higher orders of government. A second example is the case of Lake Simcoe, in Ontario, Canada, where urgent action was needed in a watershed that was suffering from severe eutrophication due to phosphorus loading. Although the area did have a watershed organisation, the scope of its powers did not extend to legislating a reduction in phosphorus emissions. To address this issue, the province of Ontario passed the *Lake Simcoe Protection Act* (2008, S.O. 2008, c. 23), which requires that the various governments with jurisdiction within the Lake Simcoe watershed harmonise their management of land and water in accordance with the *Act* in order to reduce phosphorous runoff and emissions. Notably, the *Act* includes some subsidiarity, as some governance activities were delegated to sub-provincial governmental authorities; it also includes participation through the mandatory public participation in specific decision-making processes. This, then, is an example of a specific action taken at one level of government (i.e. the province), but targeted for another (i.e. the watershed). It suggests that not all watershed-scale issues need be

resolved by watershed organisations alone; at times, it may be more appropriate to legislate at other governance scales, depending on the scope of powers for each level of government. This speculation ties back in with earlier comments about the necessity for clarity of roles within a re-scaled governance model. Thus, in answer to the question of what decisions are best made at a watershed scale and what decisions are best made elsewhere, we offer two broad suggestions. First, standard-setting might be best done at other regulatory scales, and second, we highlight the fact that policy implemented at a watershed scale need not necessarily be created by a watershed-scale organisation.

A third possible entryway to analysis speaks to the question about the relationship(s) between IWRM and watersheds. How do IWRM and watersheds relate to one another; can you have one without the other? An analysis focusing on this question could draw on an existing debate with respect to the utility of IWRM<sup>10</sup> and extend this to an examination of its different components and their connections. A preliminary exploration of this relationship is already underway. Saravanan et al. (2009) see watersheds as a management instrument of IWRM; Molle (2008) takes a more critical approach in his exploration of narratives in water policy, seeing IWRM as an unattainable "nirvana concept" that provides justification for river basin- (or watershed-) scale governance models. Future analyses could look at, for example, what scales best facilitate integration of different water governance components (land and water, surface water and groundwater, different branches of government, and so on), or how participation and integration may or may not work together. Teasing apart IWRM's components could lead to a richer analysis than our current understanding allows. Our speculation is that watersheds are not a necessary component of IWRM. In fact, the Global Water Partnership, a leading body on IWRM, advocates for the context-driven application of IWRM principles and strategies, specifying that "there is not one correct administrative model. The art of IWRM lies in selecting, adjusting and applying the right mix of these tools for a given situation" (GWP, 2010). If existing governance frameworks are weak and watershed-scale capacity is low, there is no reason to believe that re-scaling integration will be met with any greater success than integration at existing scales; indeed, it may compound problems by delegating challenges to new institutions with low capacities. If, however, the watershed(s) in question have the capacity to take on a new, more integrative model, there is no reason why they are less eligible to do so than their jurisdictional counterparts. In essence, watersheds are one possible element of integration, but need not be their foundation. Moreover, particular components of the IWRM package may be more or less palatable in different locales. Chess and Gibson (2001), for example, note that public appetite for watershed-scale participation is uneven, and that in some cases, the desire to participate in such initiatives is minimal. To implement a watershed-scale governance model in these locales is unlikely to succeed in its aims. All of these examples suggest that the utility of watersheds for the purposes of IWRM may be a function of the context in which they are being applied. While the uptake of IWRM, watersheds, or any other number of water governance reforms may be most tempting in situations where existing water governance regimes are inadequate or are failing to meet basic needs, we also know, as discussed above, that these are the cases where such reforms are most likely to be met with significant challenges. We contend that breaking out the component parts of IWRM and querying how the different component parts of IWRM may or may not be appropriate on a case-by-case basis is a more fruitful line of inquiry than a panacea approach to the application of the IWRM package. As such, watersheds may be useful to include in IWRM in some cases, and in other cases, not. We would argue that watersheds are a negotiable component of IWRM, and may be better suited to some applications of IWRM than others.

## CONCLUSION

The development and uptake of the concept of watershed boundaries was in part an effort to address environmental governance more effectively, yet challenges associated with the unit's uptake continue

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<sup>10</sup> For an extensive debate on the utility of IWRM, see discussion between Biswas and Mitchell in *Water International*, 2004.

to beset its implementation. Through an examination of these challenges in light of the emergence and development of the concept of watersheds, this paper has argued that the jump from watersheds as technical tools to watersheds as policy frameworks has been problematic. In particular, we suggest that the challenges identified in the first part of the paper may be symptoms of the lack of attention to governance issues in the transition from tool to framework. As such, the challenges might not necessarily lie with watersheds *per se*, but with the governance tools and paradigms with which watersheds have been conflated under the rubric of the 'watershed approach'.

By untangling watersheds from other concepts with which they have been conflated, watersheds can be re-framed as tools, or choices, that can be marshalled in support of particular policy goals, rather than as mandatory, unquestionable starting points for effective water governance. Teasing apart watersheds in this way facilitates a foray into an analysis of watersheds in and of themselves. Such an analysis is outside the scope of this paper, but paths for future analysis and discussion are suggested. Three lines of inquiry were suggested as starting points to such an analysis: when are watersheds appropriate or useful? What kinds of decisions are best made at the watershed scale? What is the relationship between IWRM and watersheds? Using these questions as starting points, we suggested that watersheds might be appropriate in cases where challenges are hydrologically defined and where strong governance mechanisms already exist. Further, we suggested that watersheds might be less useful than other governance scales for setting water quality standards or in cases where existing governance mechanisms are weak, public interest is low, or analysis shows it is best left out of integration efforts.

Overall, we encourage the thoughtful consideration of the uptake of watersheds as governance units – flaws and all – before embarking on re-scaling efforts.

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