

ENHANCING THE SUSTAINABILITY OF COMMUNITY-BASED WATERSHED INITIATIVES THROUGH SOCIAL NETWORK ANALYSIS

Adam C. Springer¹ and J.E. de Steiguer¹

This study explores the utility of social network analysis in enhancing the sustainability of two community-based watershed initiatives in southern Arizona. The first is a watershed stakeholder group that relies upon serial volunteerism to support watershed-scale projects. The second is an environmental non-profit that facilitates community-based efforts to improve urban water quality. Social network analysis is used to provide descriptive information about the structures of these two watershed initiatives. This analysis reveals distinct characteristics about the networks that can be used to both better understand how community-based watershed initiatives function and inform strategies for ensuring their ability to respond to challenges over time.

USING SOCIAL NETWORK ANALYSIS TO DESCRIBE GROUPS

Despite their growing numbers, community-based resource management initiatives are plagued with problems (Byron and Curtis 2005; Koontz and Thomas 2006). They must continually respond to both internal and external challenges, often with extremely limited resources (Folke et al. 2005). If we are to better understand how to improve the long-term viability of these initiatives, we must first understand how groups function and the reasons for which stakeholders are involved.

Social network analysis provides complementary theoretical, graphical and statistical elements to describe and analyze groups. This methodology provides a means to both characterize a network and facilitate inferential statistical analyses on the factors that affect the success of groups over time. This study focuses on two types of participatory watershed initiatives and discusses how social network analysis might be used to identify factors that may affect their sustainability. This information can ultimately be used to eliminate obstacles to fostering wider participation and enhancing the success of stakeholder efforts.

Graphical representations of social networks can display people, their relationships with each other as well as affiliations with events or organizations. Figures 1 and 2 present the networks of the two community-based watershed initiatives discussed in this study: a watershed stakeholder group and a series of water quality workshops.

Figure 1 displays characteristics of public participation in the Cienega Creek Watershed in southeastern Arizona

in 2007. In this figure, stakeholders are represented by squares, called nodes, and stakeholders with some form of contact have a line between them, called a tie. As this figure indicates, the Cienega Creek Watershed has two stakeholder groups involved in the watershed. Each group identifies as being independent, however the two groups have the shared goal of stewarding the resources of the same watershed. This figure illustrates which participants have contact with each other and the collaboration that occurs both within groups and between groups. Figure 2 displays a very different type of community-based watershed initiative. This network shows participation in a series of six public workshops conducted in 2008 by the Watershed Management Group, a Tucson-based non-profit. This figure is called a two-mode network because events are displayed in addition to participants and their relationships. Each square represents a single workshop and each person is represented by a single circle. The facilitator of the network is represented by the black circle in the middle of the diagram. This figure reveals who attended which event and how many events any given person attended.

Using Social Network Analysis to Enhance Sustainability

Although several metrics exist for analyzing group structure, three fundamental statistics may provide insight into the structure of a group: degree, density and betweenness. By measuring how these statistics change over time and the factors that influence them, substantial insight will be gained into how to foster more efficient, effective and sustainable groups.

Degree is the simplest of these metrics, and is simply a count of the total number of individuals with whom a person has contact. Density is a statistic that indicates the total number of ties observed in a network relative to the total number of theoretically possible ties. Betweenness is a measure of the ability of an individual to control the flow of information or resources in a network. Individuals that lie on the shortest path between other individuals have relatively high betweenness values (Knoke and Yang 2008; Wasserman and Faust 1994).

In terms of sustainability amongst stakeholders, it would be desirable in many cases for groups to have high degree and density values. High values for these statistics would indicate that stakeholders are communicating with several other stakeholders in the network. Betweenness values, however, ought to be low amongst stakeholders. Low

¹School of Natural Resources, University of Arizona, Tucson, Arizona

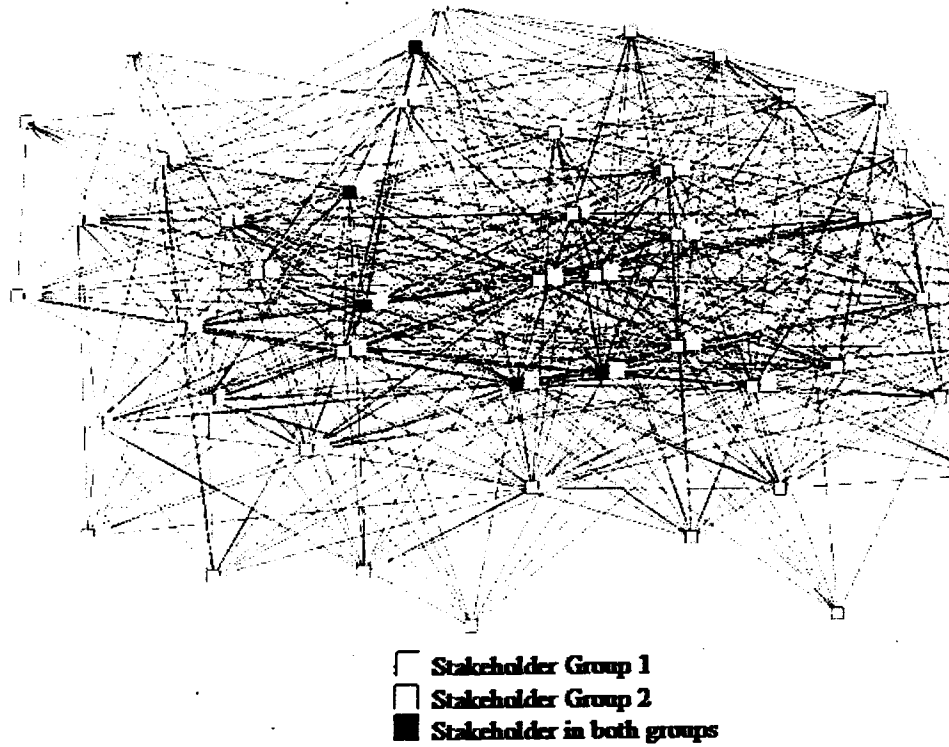


Figure 1. Cienega Creek Watershed Network.

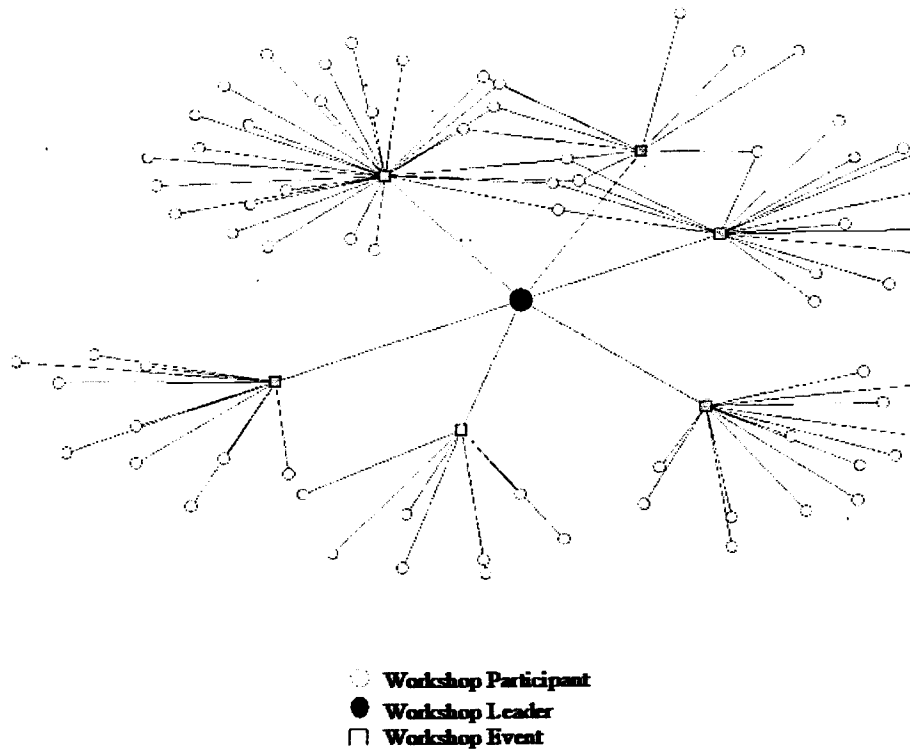


Figure 2. Watershed Management Group Network.

betweenness values indicate that resources are being shared equitably and that no single person dominates the network. Groups containing members with high degrees, high densities and low betweenness values ought to be relatively better equipped to cope with the loss of members, thereby enhancing the sustainability of the group over time.

CONCLUSIONS

This paper explores the role that social network analysis can play in providing insights into the threats to stakeholder group sustainability and opportunities for recognizing when this sustainability is threatened. We provide a baseline analysis of the network structure of two very different community-based watershed initiatives to illustrate how this methodology is applicable to different participatory activities.

We find that social network analysis is a technique capable of providing substantial insight into the complexities of community-based resource management

activities. This information will be useful to participants, facilitators and policymakers who wish to improve the sustainability of these initiatives.

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