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Mapping ambivalence: Exploring the geographies of community change and rails-to-trails development using photo-based Q method and PPGIS

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Abstract

As the literature on trail development suggests, recreational trail projects can generate conflicts and controversies, particularly when built on abandoned rail corridors through developed areas. These conflicts are often understood as "not in my back yard" (NIMBY) reactions, suggesting a spatial proximity to conflict which increases as one draws closer to the proposed trail. This research seeks to understand local residents' perceptions and reactions to recreational trail development in the City of Delaware (Ohio, USA). It addresses two spatially infused questions: Does the potential for conflict related to trail development increase as people live closer to a potential trail (the NIMBY factor)? Can important qualitative factors about favorable and unfavorable land uses including potential recreational trail sites be defined using a participatory methodology and then represented in GIS? The study used a mixed-method approach to collect and analyze qualitative data from a group of local residents. Each participant was interviewed and asked to sort 19 pictures related to trail development. After each of the sorts, participants were asked to explain why they ranked the pictures the way they did. Results of the picture sorts were then analyzed using Q method and mapped with GIS. The results show that spatial proximity matters in the context of trail development and potential NIMBY reactions to trails. Significant differences were found in the picture sorts that reveal the importance of proximity and location, although in a manner contrary to the assumptions in the writings on rails-to-trails. Through combining qualitative methods, Q analysis and PPGIS analysis, the research shows that qualitative place-based studies are capable of generating insights about the complexities of situated geographic change such as recreational trail development.

Keywords: GIS; Qualitative method; Q method; PPGIS; Recreational trails; Ohio

1. Introduction

Recreational trails are curious phenomena: despite seeming innocuous, they can generate conflict and controversy, particularly as they are built on abandoned rail corridors or through already developed areas. Trails, the literature on trail development suggests, generate "not in my back yard" (NIMBY) reactions, embodying a geography of conflict which increases as one draws closer to the proposed or developing trail. Recreational trails, then, have a substantive geographic component, from the simple (lines through space) to the complex (the social, cultural, and economic spaces bisected by trails, and the spatial variations in NIMBY responses). Thus recreational trails or potential trails may be mapped, planned, and implemented with the aid of Geographic Information Systems (GIS).

GIS is by no means a new tool for determining ideal locations for linear features such as recreational trails. GIS is particularly good at representing tangible, visible phenomena in the environment (such as roads, terrain,

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and water features) and some less visible but still mappable phenomena such as political or property boundaries. Once in GIS, these layers of information can be used to generate potential routes for recreational trails: trails should follow rivers or streams, avoid large changes in slope, and connect parks, schools and neighborhoods. While this information is useful for spatial decision-making, it misses the complex geographies of lines as they thread through diverse human spaces. Although trails are something most people want near their home, as the literature suggests, they may arouse subtle ambiguities, ambivalences, and anxieties at the community level that cannot be easily represented in GIS.

This study explores the multiple reactions to trail development from the perspective of local residents who live in the area and are/will be affected by new trails. Informed by the Public Participation GIS (PPGIS) literature, it focuses on two spatially infused questions. First, does the potential for conflict related to trail development increase as people live closer to a potential trail (the NIMBY factor)? Second, can important qualitative factors about favorable and unfavorable land uses including potential recreational trail sites be defined using a participatory methodology and then represented in GIS? With these questions in mind, we seek to improve upon the shortcomings of typical GIS analysis that starts without participants' input or that is completed and then shared with community members to help justify the results. In direct contrast, this study collected qualitative data from participants about their views prior to GIS analysis in order to formulate participant-defined questions and to shape the GIS analysis.

Data for the study were collected from 16 residents of the City of Delaware (Ohio, USA). Each participant was interviewed and asked to sort 19 pictures related to trail development based on the following two statements: "I would like to see this in the City of Delaware" and "I would like to see this next to my home." In the picture sorting exercise, participants determined which images they most strongly agreed with and which images they most strongly disagreed with. For example, a participant could look at an image of an abandoned railroad and strongly disagree with the abandoned railroad being next to their home. A participant could rank an image of a busy recreational trail as something that they would strongly agree with being next to their home. After sorting the 19 images, participants were asked to explain why they ranked the pictures the way they did. Results of the picture sorts were then analyzed using Q method and mapped with GIS. The results show that spatial proximity matters in the context of trail development and potential NIMBY reactions to trails. Significant differences were found in the picture sorts that reveal the importance of proximity and location, although in a manner contrary to the assumptions in the rails-to-trails literature. Through combining qualitative method, Q analysis, public participation and GIS analysis, the research shows that qualitative place-based studies are capable of generating insights about the complexities of situated geographic change such as recreational trail development.

2. A review of the public participation GIS literature

In the last few decades, GIS have increasingly been utilized in community-planning projects (Carver, 2003; Craig et al., 2002; Elwood and Leitner, 1998; Ghere and Rismiller, 2001; Ghose and Elwood, 2003; Harris and Weiner, 2002; Kellog, 1999; Merrick, 2003). GIS mapping and analytical tools have improved access to and availability of spatial information for community organizations, and have raised diverse theoretical issues (Craig et al., 2002; Harris and Weiner, 2002). Public Participation GIS explores theoretical issues related to GIS implementation where the goal is to engage community members in the process of spatial data collection, mapping and analysis (Harris and Weiner, 2002). PPGIS seeks to expand the use of GIS to the general public and non-governmental organizations that are not usually represented in traditional top-down GIS projects (Craglia and Onsrud, 2003; Ghose, 2001; Ghose and Elwood, 2003; Talen, 1999, 2000). Alternative epistemologies to contemporary GIS research are addressed in the five main tenet of PPGIS research, which include (Weiner et al., 2002):

(1) Integration of qualitative data in GIS.
(2) Differential access to technology and data.
(3) Place-based GIS methodologies.
(4) Integration of multiple realties in GIS.
(5) Relationship of GIS to the local political and community contexts.

One of the main ways in which PPGIS research differs from the majority of GIS research is that qualitative information and "expert" quantitative data are both given prominence in GIS (Craig et al., 2002; Harris and Weiner, 1998; Obermeyer, 1998; Weiner et al., 1995). While traditional GIS data (crime incidents as points, parcels as polygons and roads as lines) are needed for community mapping and analysis projects, PPGIS researchers argue that local knowledge held by members of the community is usually absent from traditional geographic information systems. Local knowledge of place and opinions from the community, PPGIS researchers argue, can be included in GIS to complement or strengthen existing geo-spatial information (Dennis, 2006; Knigge and Cope, 2006; Kwan and Knigge, 2006).

For example, a PPGIS study of local smart growth planning strategies in Monongalia County, WV included maps and data compiled by local residents to highlight "natural areas" and green spaces that should be preserved with proposed planning regulations (Hawthorne et al., 2006). This study also used local knowledge to highlight sprawling subdivision developments that were causing increased flooding from surface runoff. Projects such as this include community local knowledge to highlight silences in typical GIS data.

PPGIS research also explores differential access to data and technology. Assessing the appropriateness of technol-

ogy in community projects is vital to the success of a community GIS project (Craig et al., 2002). One pitfall of many GIS projects is that organizations often choose complicated GIS software and hardware, when a low-technology approach may in fact be more appropriate for community participation (Weiner et al., 2002). Whether with "smart board" technology, paper and pencil maps, interpretation of aerial photography, sorting of photographs, community 3D modeling or Internet GIS, the technological expertise of participants and the necessary level of sophistication needed for the particular task are important considerations for PPGIS projects.

For example, some PPGIS researchers have implemented Internet-based data collection methods to integrate local knowledge into GIS (Alagan, 2003; Al-Kodmany, 2002; Carver et al., 2000; Krygier, 2002; Peng, 2001). While these systems help integrate local knowledge and provide another avenue for public participation, some have argued that these high-technology systems inhibit participation for certain segments of society (mainly the poor and those unfamiliar with computer technology) (Craig et al., 2002; Elwood, 2002). Many community members do not have access to computers or the Internet and many also do not have the computer literacy necessary to effectively interact with these systems. These issues often make high-technology systems, such as Internet GIS, inappropriate for community GIS projects.

PPGIS users, researchers, and community groups suggest that there are low-technology methods for incorporating local knowledge with the formal, technical data already represented in GIS (Craig et al., 2002; Harris and Weiner, 1998; URISA, 2002–2006; Weiner et al., 1995). In PPGIS projects local knowledge is often collected through traditional public planning meetings, small focus groups, in-depth interviews, GPS transect walks, residential surveys and community mapping exercises.

Gathering local knowledge through place-based data collection methods is another important tenet of PPGIS research (Aberley, 1993; Barndt, 2002; Casey and Pederson, 2002; Elwood, 2002; Harris and Weiner, 2002; Jordan, 2002; Kwaku-Kyem, 2002; Leitner et al., 2002; Macnab, 2002; Parker and Pascual, 2002; Weiner et al., 2002; Weiner and Harris, 2003). Studies of land and agricultural reform in South Africa suggest that local knowledge cannot be fully understood by simply using traditional GIS data (Harris and Weiner, 2002; Weiner and Harris, 2003). According to Harris and Weiner (2002),

> Much of a community's knowledge is heavily qualitative in nature and invariably based on oral history and the experience of having lived in a place for some time. Capturing this knowledge in a GIS that relies heavily on the spatial primitives of point, line, and polygon and the quantitative ordering of information is no easy task (247).

Incorporating multiple perceptions in GIS is also important to Public Participation GIS researchers (Abbot et al., 1998; Craig et al., 2002; Leitner et al., 2002; Weiner et al., 1995). When soliciting information for community projects, researchers often find that many different perspectives exist. PPGIS researchers argue that these multiple opinions and understandings of place must be represented in GIS to highlight the different views represented within a community. While every community member may have a different "reality," the strength of PPGIS projects is that these projects often force community members with dissimilar views to work together in an interactive setting (such as a community planning meeting or a mapping exercise). These interactions often help to identify areas of potential consensus and contention, while retaining the uniqueness of each participant's perspective.

PPGIS researchers are also concerned with exploring the relationship of GIS to local political and community contexts. These researchers note that the local political climate often has a large effect on the success of PPGIS projects (Craig et al., 2002; Leitner et al., 2002). Communities that have the money for GIS, have GIS capabilities, and have people knowledgeable of GIS often experience the most success with GIS projects. PPGIS projects often benefit from community–university partnerships in local settings (Leitner et al., 2002). In these partnerships, universities provide students, facilities, hardware and software and GIS expertise in hopes of assisting the community with its mapping and analytical needs. In turn, community members and groups provide universities with an avenue for entering the community to do research and learn about real world problems, provide a vast amount of local knowledge and provide individuals who are passionate about community issues. Together these two groups can form a powerful alliance where mutual needs can be met through action research or participatory research (Leitner et al., 2002).

As the above review of the Public Participation GIS literature suggests, this body of research is concerned with offering alternative epistemologies to contemporary GIS research (see the discussion in Kwan, 2004, 2007a,b). Through the addition of qualitative data, the integration of local knowledge, the implementation of place-based methods and a commitment to local contexts, PPGIS helps reveal community, political and social issues that may not arise in more traditional GIS analyses. Furthermore, this body of research offers a community-infused understanding of place where local residents' issues are brought to the forefront of the research agenda to either challenge or confirm existing knowledge of place and place-based processes.

3. Land use conflicts in recreational trail development

While arguing for an innovative approach to data collection (PPGIS based Q method picture sorting), our study not only contributes to the PPGIS literature, but also addresses a significant community development issue: trail development and subsequent community reactions to this development. In addition to the PPGIS literature, it is

important to explore the largely non-academic writing on recreational trail development since much of the literature on recreational trails is provided by organizations that support trail development (e.g., The Trails and Greenways Clearinghouse and the Rails-to-Trails Conservancy). A review of these writings reveals complex and polarized reactions to rails-to-trails conversion projects (Rails-to-Trails Conservancy, 2006). While there are often many supporters of trails, it is also common for projects to generate conflict, particularly by disgruntled adjacent landowners. Negative perceptions from concerned residents about potential trails often threaten and/or delay the development of recreational trails.

The writing on rails-to-trails tends to stress that recreational trails are well received by community members (Trails and Greenways Clearinghouse, 2006). It provides a diversity of arguments in favor of trails (Frank et al., 2006; McLaren, 2002; Moudon et al., 2005; Pearce et al., 2006; Poelzer, 1999; Reed et al., 2004; Ryan, 1993; Spalding and Kelly, 2002; Wang et al., 2005). A study by Lindsey et al. (2001) suggests that city officials, neighborhood association leaders and community members view greenways and recreational trails as key tools that can spearhead future development and increase property values. Daniels and Lapping (2005) suggest that the addition of recreational trails can also serve as the catalyst for other planning efforts such as conservation of habitats, water resource planning and further recreational plans.

The literature also suggests that trails can have positive impacts on public health. According to Frank et al. (2006), Moudon et al. (2005), Pearce et al. (2006), Reed et al. (2004) and Wang et al. (2005), a major component of recreational trails is their ability to provide opportunities for increased physical activity. Frank et al. (2006) show that those who live in "walkable" neighborhoods walk 30 min more a week for travel purposes and engage in more total physical activity. A study by Moudon et al. (2005) in King County (Washington, USA) concludes that residents believe they would cycle and exercise more often if more trails were located in their community. The survey they conducted shows that 49% of respondents (both cyclists and non-cyclists) believe more bicycle trails and lanes connected to their neighborhoods would increase bicycling activity.

Rails-to-trails projects do have opponents, typically adjacent landowners who do not want a trail 'in their backyard'. Opposition is peppered with concerns about property values and safety, and some property owners expect that when a rail corridor is abandoned, the rail right-of-way adjacent to their property will revert to their ownership (and this may be part of the property deed). Trail opponents often believe trails near their homes will decrease their property value, increase crime, and destroy their privacy (Trails and Greenways Clearinghouse, 2006). The literature thus suggests geographic conflict is inherent in opposition to trails: the closer people are to a potential trail, the greater the chance they will have a NIMBY reaction (Rails-to-Trails Conservancy, 2006). The literature, however, suggests that the opponents' concerns are based on mistaken perceptions, which play a large role in the contention and hostility toward rail-trail conversions (Trails and Greenways Clearinghouse, 2006).

Proponents of trails respond with research findings suggesting that these perceived risks of trails are actually false (Rails-to-Trails Conservancy, 2006; Little, 1995). A 1998 study of property values along the Mountain Bay Trail in Brown County (Wisconsin, USA) states that lots adjacent to the trail sold faster and for an average of nine percent more than similar property not located next to the trail (Trails and Greenways Clearinghouse, 2006; Brown County Planning Commission, 1998). A study of recreational trails in Omaha (Nebraska, USA) further suggests that 68% of respondents believe the presence of trails near homes has a positive impact on home purchase (Greer, 2000; The National Trails Training Partnership, 2006).

The potential for criminal activity (due to new trails) is one argument against trail development (Ryan, 1993; Little, 1995; Poelzer, 1999; McLaren, 2002; Spalding and Kelly, 2002). Residents near trails worry that trails bordering their property will give thieves easy access to their personal property. Research, however, shows that this perception of increased crime from recreational trails is unsubstantiated. A survey of residents living near recreational trails in Omaha shows minimal reports of crime and theft near trails. Four percent of study respondents reported theft as a problem associated with trails and another 4.7% reported property damage from trails.

Overall the writing on rails-to-trails tends towards casting a positive view on the impact of trails on the local economy, community health and safety, while also tending toward practical, instrumental assumptions about the potential negative reaction of adjacent landowners, which are addressed with practical, instrumental data, such as studies showing the increase in property values after a trail is built, or the lack of any increase in crime. There is a geography to the rails-to-trails perspective on the impact of trails: a positive perspective at the community level, with the potential for increasing opposition from those who live nearer to the potential trail.

While there are various arguments for and against recreational trails, this study seeks to explore the variations in opinion about trails and other forms of land use development using a qualitative methodology combined with GIS analysis. The study uses qualitative data collected from Q method picture sorts with a small sample of community members in order to shape a preliminary GIS analysis of trail development in Delaware, OH (USA). The study is committed to the main tenants of PPGIS summarized above. In particular, we are committed to addressing the perceived lack of qualitative data integration with GIS as outlined in the PPGIS literature and in trail development research outlined by Turco et al. (1998). Turco et al. (1998) strongly argue that qualitative research must

accompany studies of potential trail sites to understand the underlying reasons for opposition to trails.

This study explores a methodology for collecting and analyzing qualitative information from local residents. Furthermore, the study identifies where planned and proposed trail development sites might be most accepted by community members as these recreational land uses replace or minimize the impact of other less favorable land uses. In line with PPGIS researchers' commitment to exploring multiple realities, this research also includes dissenting viewpoints from community members that run counter to the majority opinion.

Hence, this study was shaped to address both practical and conceptual concerns drawn from our experiences with the Delaware Trails project, our reading of the writings on recreational trails and interactions with trails proponents and opponents. It is informed by the PPGIS literature and seeks to engage community members in the process of spatial data collection, mapping, and analysis (Weiner and Harris, 2003). PPGIS "have been conceived as an integrative and inclusive process-based set of methods and technologies amenable to public participation, multiple viewpoints, and diverse forms of information" (Krygier, 2002, p. 330).

4. Study area and data collection

4.1. Study area

The study area for this research is Delaware, Ohio USA (Fig. 1), a typical town in the US midwest, with industrial roots, a mix of blue-collar workers and professionals, neighborhoods of stately Victorian homes, other neighborhoods of smaller worker's homes, and a liberal arts college (Ohio Wesleyan University) whose students (many of them from outside of Ohio and the US) are part of the community. The City of Delaware, which is situated to the north of Columbus (Ohio, USA), is one of the fastest growing cities in Ohio and the US. Growth in the metropolitan Columbus area migrates northwards toward Delaware, driving rapid economic, social, and cultural change: cookie-cutter houses sprouting from farm fields, strip malls, traffic jams on newly widened roads, and an influx of professionals who labor in the sprawled suburban and exurban landscapes between Delaware and Columbus.

Delaware, Ohio, is an excellent location for studying reactions to community change and to trail development. It is situated in a rapidly changing economic and social landscape: its industrial, manufacturing, and productive landscape and social order is in rapid decline, replaced by a service and consumptive landscape and social order. There are many more people, but they are new residents – professionals or Hispanic immigrants who are not at all part of the older industrial order. Sprouting subdivisions, poorly planned and inappropriate suburban commercial development, and crowded, dangerous roads signify these changes.

Furthermore, this site with its trail development discussion is an excellent location for exploring a PPGIS methodology. This project's foundation lies in work done as part of a collaborative community-based trails mapping project with the City of Delaware, the Delaware County Friends of

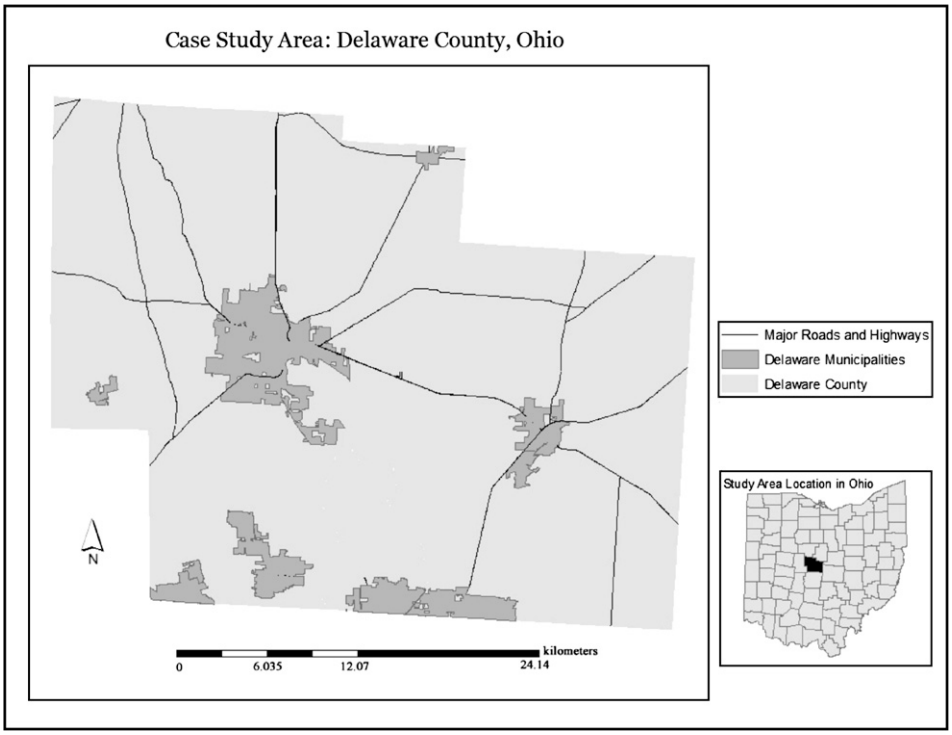

Fig. 1. Map of study area: Delaware County, Ohio USA.

the Trails community organization, Ohio Wesleyan University (OWU) geographers and other trail enthusiasts. Our interest in this particular portion of the project stems from 2002 as discussions about transforming an aban-

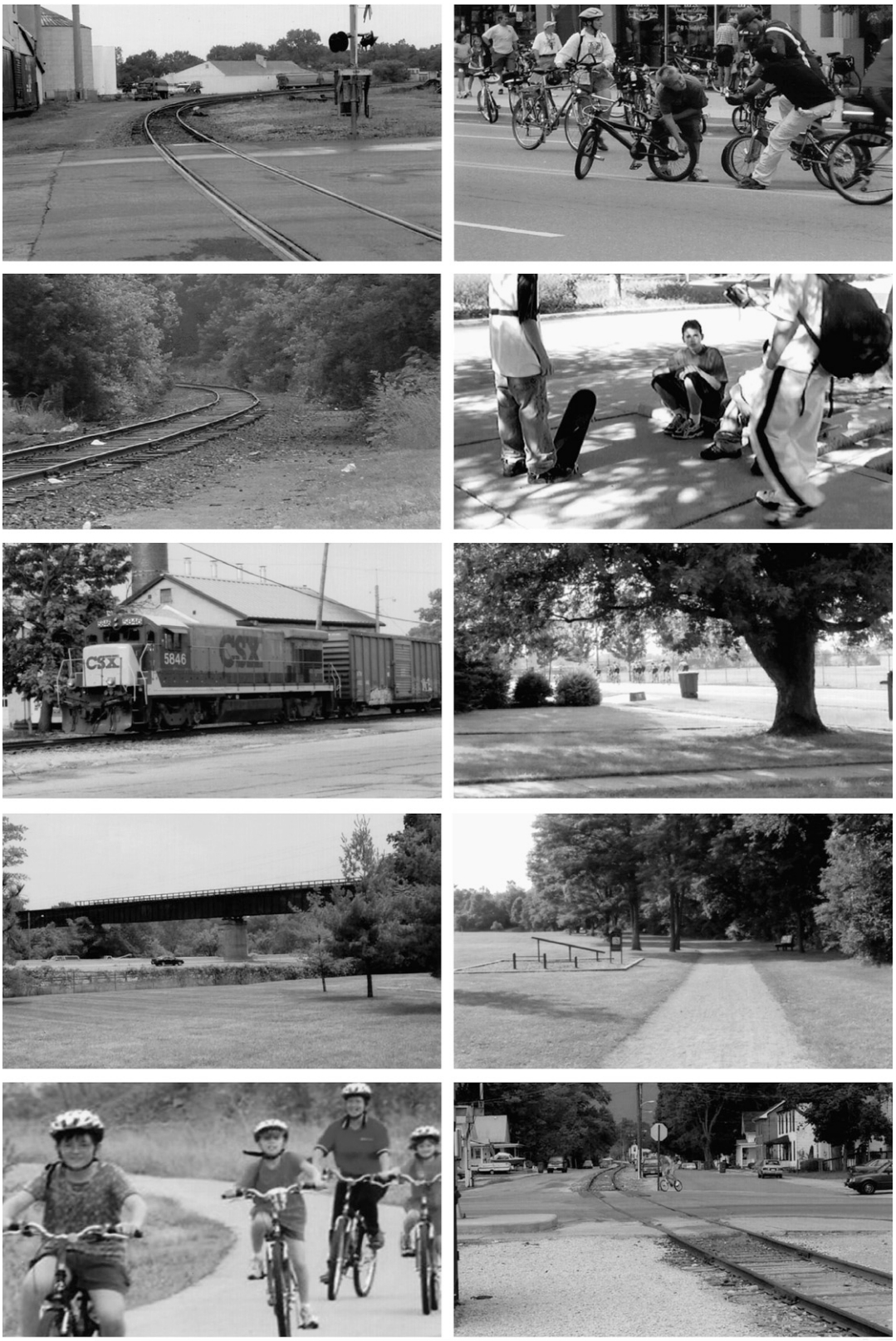

Fig. 2.1. Photos for Q method picture sorting.

doned rail corridor into a recreational trail in Delaware began. During this time, the City Recreation Director worked with an OWU GIS class to refine and expand the city's trails map. Fieldwork by OWU students included

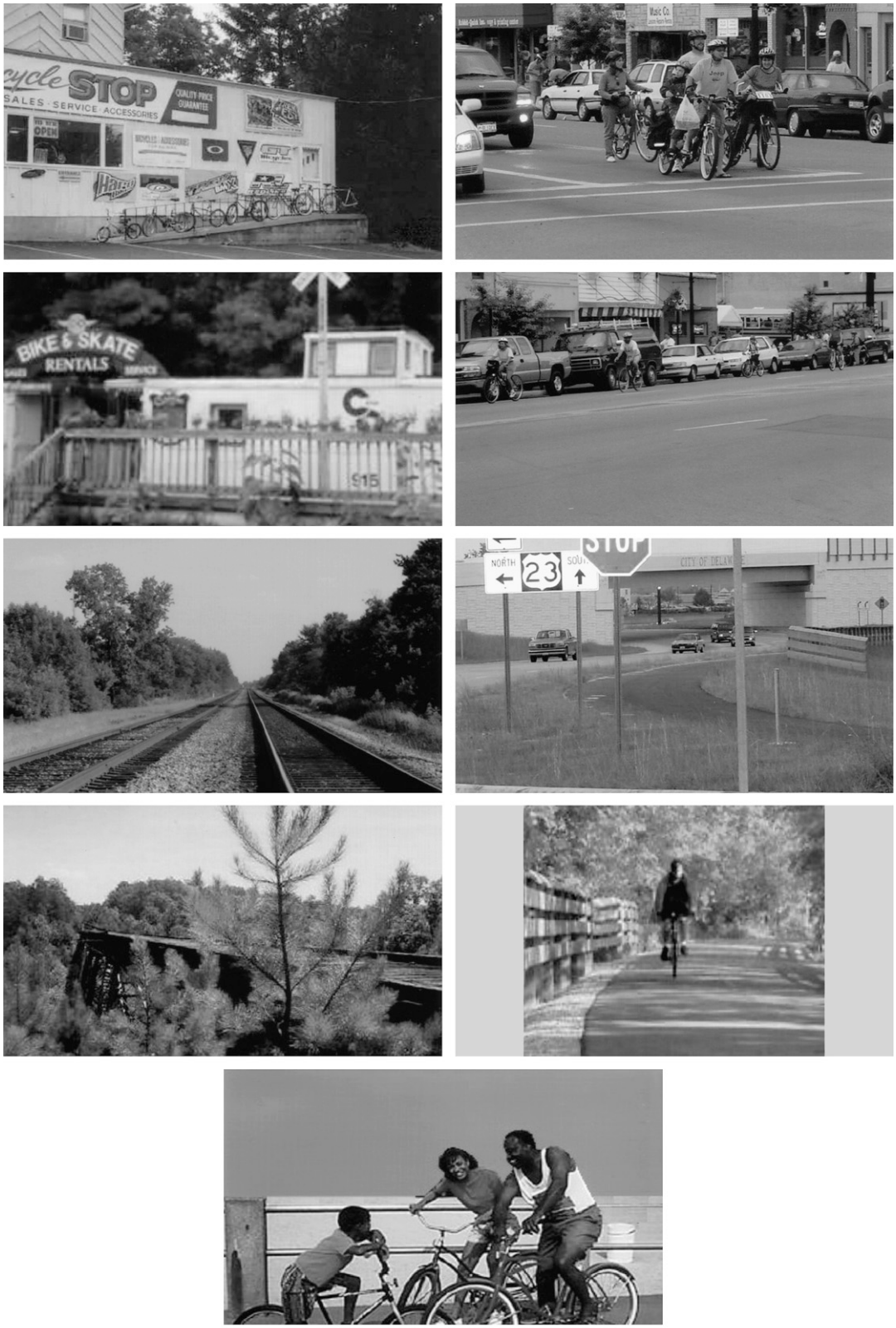

Fig. 2.2. Photos for Q method picture sorting.

GPS data collection, a trails inventory, and field assessments of existing, planned and potential trails. Such data was combined with existing GIS data (roads, right of ways, water features, property parcels, terrain, etc.). In 2002 the collaborative trails plan and map were included in the city master plan, the recreation director began to require new subdivisions to set aside land for trails, and funds were sought to construct trails in already developed parts of the city.

As a result of the trails plan, the city of Delaware approached the CSX Railroad Corporation to purchase a rail line that bisected the city of Delaware. This rail line, under-used as a spur, had originally been part of the main rail corridor connecting Cleveland to Cincinnati, and was a key component in the early industrial history of Delaware. The segment was ranked as an extremely important potential trail in the City recreational trails plan, as it cut through several neighborhoods, the Ohio Wesleyan campus, included a historic brick train station, and spanned the Olentangy River on a spectacular, late 19th century steel bridge.

4.2. Data collection

In deciding on the methodology for the study, we carefully considered the problem of differential access to data and technology. Our initial plans were to use WWW-based data collection (Krygier, 2002). However, we were concerned that this might limit participants to those who had computer access and skills. A high-technology approach also requires a significant amount of time devoted to creating and maintaining software programs (Elwood, 2002). For these reasons, a low-technology approach to collecting data was eventually chosen. It involved face-to-face interviews with participants in which paper maps, colored pencils, and photographs were used.

Sixteen participants were included in the study, all residents of the City of Delaware or Ohio Wesleyan University students. Instead of using a random sample of Delaware residents, we sought to include a diversity of participants, varying in age, time of residence in Delaware, gender, race, class, and where they lived in town. Participants ranged in age from 18 to 73. Time of residence in Delaware ranged from less than a year to more than four decades. About half of the participants were women, and half men. Most participants were white (most of Delaware is white), but were drawn from a range of classes (blue collar, professional) and different parts of town.

While the majority of participants were Delaware residents, two Ohio Wesleyan University students were also interviewed for this study. Our belief (along with the city recreation director's belief) was that OWU students represent an important usage group of the trails system. Thus, students' comments were deemed necessary in any study that examined trail development.

Participants were interviewed in their offices, on campus, or at the local library. They were informed about the nature of the study, and provided us with basic personal information (age, gender, race, time of residence, children, etc.). The meetings were taped when participants granted permission. To gather local knowledge from participants, they were asked to perform a mental mapping exercise and picture sorts (rails and trails related images depicting particular types of land use [included in Figs. 2.1 and 2.2]). The picture sorts, performed in an interactive setting where participants could tell their stories and annotate their work, were used to generate qualitative data to represent the complex human geographies of Delaware and to identify whether planned and proposed recreational trail sites would be deemed favorable or unfavorable by local residents based on their locations in relation to less favorable land uses.

5. Method: picture sorts and Q method

The results reported in the next section were obtained through analyzing the picture sorts by Q method (or Q analysis). Q method is a form of factor analysis, which seeks to identify commonalties of opinion from diverse, subjectively sorted textual statements or pictures. Q method is an excellent means for studying the subjectivity of people and assessing multiple realities. While every community member may have a different 'reality', there may be shared values or views – commonalties (or a series of contrasting shared opinions) among community members. Q method can be used to identify these commonalities, which can then be mapped in GIS and used to strengthen existing spatial data for use in planning discussions. Our Q method study design is distinguished by the use of photographs (most Q sorts are of textual statements) and by the dual sort (''in Delaware'' versus ''next to home'') intended to assess the geography of NIMBY and the effect of scale on participants' views about recreational trail development. Since our study aims at generating qualitative data that enhance our understanding of favorable and unfavorable land uses in the context of rails-to-trails development, our design focuses mainly on the visual and mappable and includes spatial variables (such as proximity).

Q method can be contrasted with traditional opinion surveys where the goal is to compare patterns of opinion between predetermined groups. In such surveys, one would pose a question such as: ''what proportion of men and women strongly support rail-trails?'' In order to find the proportion, researchers might ask subjects to rate the statement: ''rail-trail conversions are a good thing.'' The responses would be limited to strongly agree, agree, no opinion, disagree, and strongly disagree. While the traditional opinion survey allows researchers to understand where predetermined groups of people stand on a particular issue, this method is based on assumptions about the kind of groupings that exist among study participants: men versus women, young versus old, conservative versus liberal, and so on (Robbins, 2004; Robbins and Kreuger, 2000; Swaffield and Fairweather, 2000).

Q method is much more exploratory and is designed to study the subjectivity ('multiple realities') of groups (Robbins, 2004). The goal of Q method is to compare patterns of opinion within the entire tested group, and to pull out significant factors or commonalties, among the participants. For example, a Q analysis might suggest that older female long-term Delaware residents and male college students have very similar perspectives on rails and trails in Delaware. Thus, there are no predetermined groups: the method seeks to find groups.

Our study included two different sorts of 19 photographs. While many Q method sorts use textual statements, we decided that images of rail and trail-related phenomena would seem more 'real' to participants, and lend themselves to mapping. We used a double sort of the photos to see if participants sorted differently based on proximity to their home. One sort assessed participants' preferences in the City of Delaware and was based on the statement "I (would) like to see this in the City of Delaware." The other sort evaluated preferences near their home and was based on the statement "I (would) like to see this next to my home." Each of the 16 participants in the study was asked to perform these two sorts. This created the data of 32 pictures sorts for subsequent analysis. We chose photographs that represented various land uses and trail-related phenomena, influenced by our reading of the rails-to-trails literature. Photographs of industrial areas, rail lines, green spaces, trail-related development, and automobiles were included to elicit responses about land use. Different groups on bikes (families on roads, families on trails, children on the street, bikes on paths, and individuals on secluded trails) were also included in these photographs.

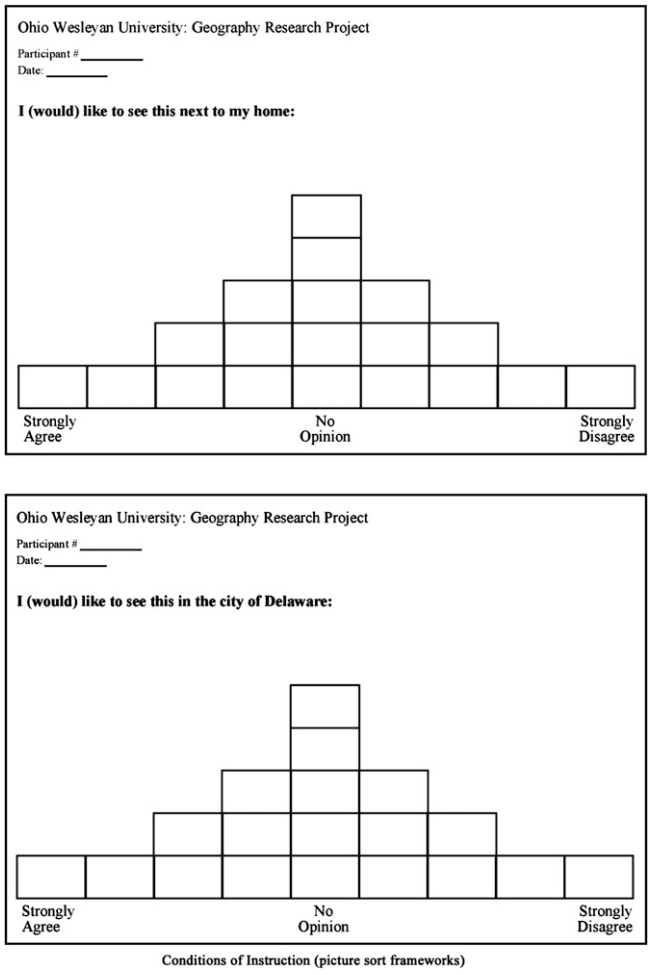

Fig. 3. Q method picture sorting framework for participants.

Participants were asked to assess what they saw in each of the pictures. For example, a participant may react against a photograph of a trail because of a piece of garbage by the trail ("I hate to see litter") or be favorable towards the same image because of the greenery adjacent to the trail ("I like the woods"). Participants were then asked to sort the 19 pictures based on a scale of strongly agree to strongly disagree. Participants were given a pyramid-shaped handout for ranking the pictures (Fig. 3), and were provided with two "conditions of instruction" (what the ranking is about): "I (would) like to see this in the City of Delaware" and "I (would) like to see this next to my home." After each ranking participants were asked to explain why they ranked the pictures the way they did.

6. Results

The results of the 32 picture sorts were analyzed using a free Q method software package called PQMethod. We were interested in learning whether or not relative location and geographical scale played a role in reactions to trail development (hence the next to my home versus in my community sorts). In addition, we were interested in identifying which proposed trail development sites were favorable based on their relative location to participant-defined unfavorable land uses found in the Q analysis. It was our hope that this analysis would help identify which trail locations were more likely to be accepted by community members based on the land uses they were replacing or minimizing.

Our results are somewhat limited in that we are at the low end of participants in a typical Q method survey (although Q method can produce significant results with a small number of participants, unlike traditional opinion surveys). Our methodology and interpretation of results were guided by the experiences and knowledge of one of the authors about the case study and the more general context of rail to trail conversions.

As we collected data about trail development through the picture sorts and interpreted the results, we were cognizant of the fact that photographs, in particular, without an accompanying explanatory text can present vague meanings and be open to multiple interpretations (Dennis, 2004). To minimize these issues, we asked participants to discuss what they saw in each image and explain why they ranked the images the way they did. Including this additional step in our research methodology helped understand participants' thought processes and eliminated some of the problems related to using images in PPGIS noted by

Dennis. The sorting of photographs provided some interesting results and differed from the majority of Q method studies which have participants sort textual statements.

6.1. Results of the "next to my home" sort

We first analyzed the 16 sorts based on the statement "I (would) like to see this next to my home." The general supposition in the rails-to-trails literature is that proximity leads to conflict, and we expected to find less favorable opinions about trails close to home, or at least a greater diversity of opinions.

Surprisingly, this supposition did not hold up in our study. We attempted to extract three factors from our data, but the third factor was insignificant. We reanalyzed the data and found one very strong factor (with an eigenvalue of 7.9, explaining 49% of the variance) and a weak second factor (with an eigenvalue of 2, explaining 13% of the variance). An eigenvalue over 1 is assumed, in the Q analysis literature, to signify a significant factor – the higher the eigenvalue, the more significant the factor. Our first factor is unusually strong, suggesting that there is significant commonality among the 16 participants in what they want and don't want to see near their home. The PQMethod software tags sorts that are representative of any factor. The most representative and defining sort (most and least favorable images) for factor 1 is shown in Fig. 4. This and other similar sorts help us to define this factor as "trails and green spaces are better than rails and industrial spaces."

As one female resident (a 35 year old single mother with a 6 year old daughter) who lives adjacent to the proposed trail development along the old CSX rail loop stated, "I like the idea of having trails in the city. We live near a lot of traffic and a lot of ugly older buildings that are falling apart. Across the street is some old railroad ties, some tracks and a couple of empty buildings...I think they are owned by the railroad company" (at the time of the study the CSX spur was being removed).

She goes onto say that: "my daughter likes to ride her bike, but I am worried about all the cars...really the drivers around here are careless about looking for walkers and kids on bikes. A trail would help clean up the area a little and give me a safe place to let my daughter ride her bike...a new trail near my house would be great."

The PQMethod software also tags sorts that are contrary to the factor: in other words, people who sorted the photographs the opposite way that most people in the factor sorted the photographs. The most distinct, contrary sort for factor 1 favors rails over trails and recreational activities. This participant, a 61 year old retired Delaware postman who has lived in the community with his wife for over 35 years on the east side of town not near any existing recreational trails was very resistant to trail development and community change in general. As he noted:

> This area is changing. We have a lot of young professionals coming into the city who think they can afford nice, new houses but can't. All the people that live up here (referring to a new development in the northern portion of the city) buy what they can't afford. I would like to see how many can't pay their mortgages in ten years! A lot of people in this city want to put up trails and replace some of the railroads. I don't like that at all. The railroads are an important part of this city's history. Without them, we wouldn't be talking right now...people just want to tear them down. We should keep them and give them historical status so they can't be touched. Young people need to know that they were important to the city's beginning. This line (pointing to the CSX loop proposed trail site near his home) was one of the most used railroads in central Ohio. Now we want to tear it down and put up a trail?

This significant outlier's picture sorts and comments were clear: "I don't like closing rail lines for bike trails." Rail-to-trail conversions represent replacing a productive, manufacturing economic and social order with a consumptive, service economic and social order. This outlier is significant as the participant represents an important type of community member (older, long-term resident, with extensive community knowledge), and, like other exploratory data analysis methods, outliers are of much importance.

The second and weaker factor in this "next to my home" sort can be defined as "trails and green spaces are better than commercial development and roads" (Fig. 5). Participants who represent this sort share the desire to have trails and green spaces next to their homes, but are strongly against commercial development and roads (with cars and bikes). As a married female resident in her late 40s who has lived in Delaware for about 25 years (not near any existing recreational trails) suggested:

> My street is becoming increasingly built up and congested...apartments and condos are being built in back of me, so there are more issues in the neighborhood, congestion and teenagers squealing their tires on the busy roads at all hours of the day and the night. I am not afraid of the people; the people are very friendly; I am afraid of irresponsibility. My neighborhood is not as pleasant as it used to be, now that there is all this new development.

Another female participant (55 years old and married) living near Merrick Trail in the upper northwestern corner of the city echoed similar favorable comments toward trail development, but less favorable toward new residential and commercial development:

> In my neighborhood, people are always walking and riding bikes with their little kids. I don't want more people coming into the area, because it will bring more congestion, more big box stores like Walmart and unsafe roads, plus I don't know all my neighbors like I used to when my kids were growing up fifteen years ago.

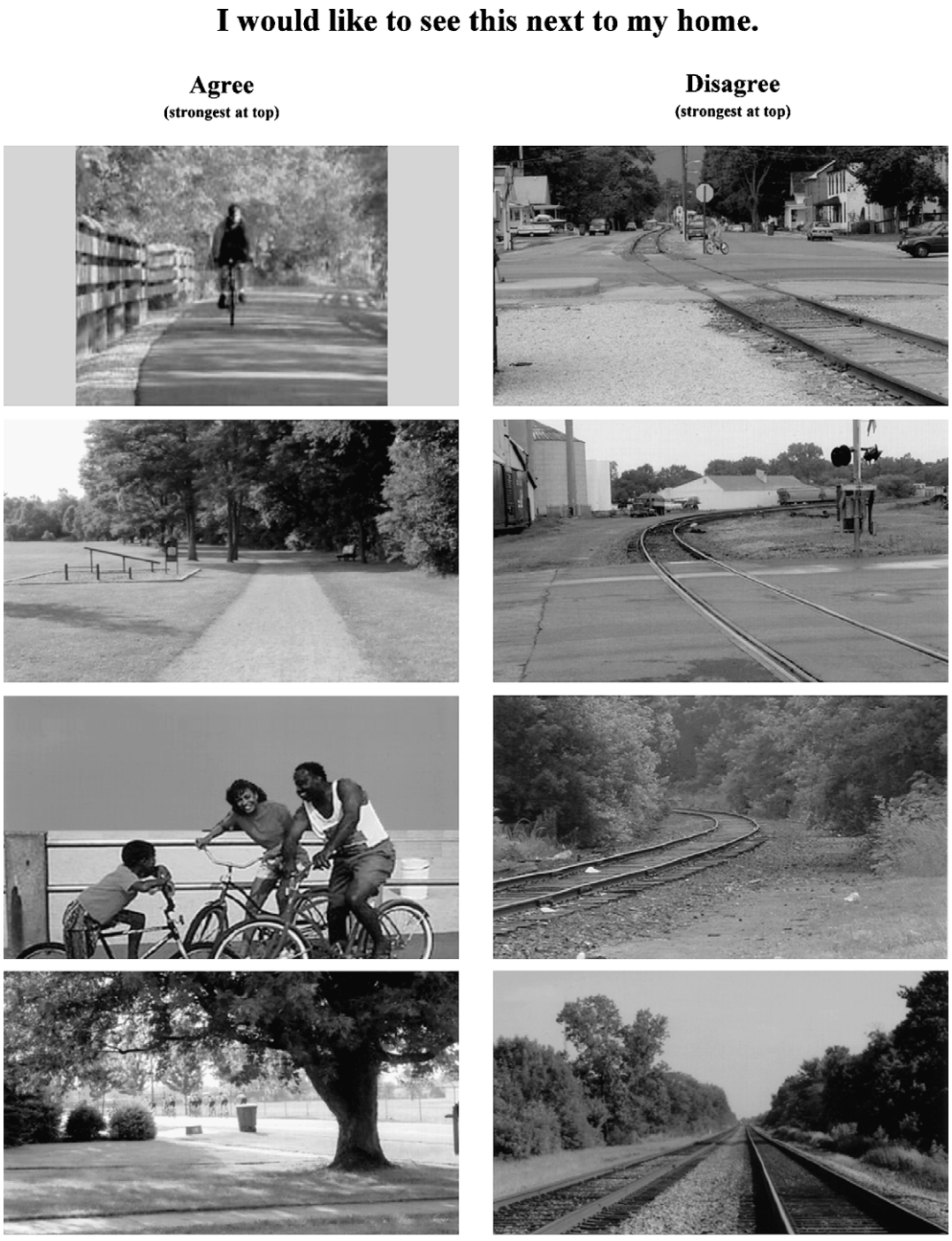

Fig. 4. Representative sort of "next to home" Factor 1.

The two factors extracted from the "next to my home" sort and subsequent participant comments suggest that trails are placed in opposition to urban development. Factor 1 sorters oppose proximity to a manufacturing-based landscape of production represented by railroads. Factor 2 sorters oppose service-based landscapes of consumption, commercial developments, and busy roads. What is most intriguing is the extremely strong support of trails adjacent to the sorter's homes that is contrary to the supposition of the NIMBY effect of trail development.

6.2. Results of the "In my community" sort

We next analyzed the 16 sorts based on the statement "I (would) like to see this in the City of Delaware." The rails-to-trails literature suggests that there tends to be strong

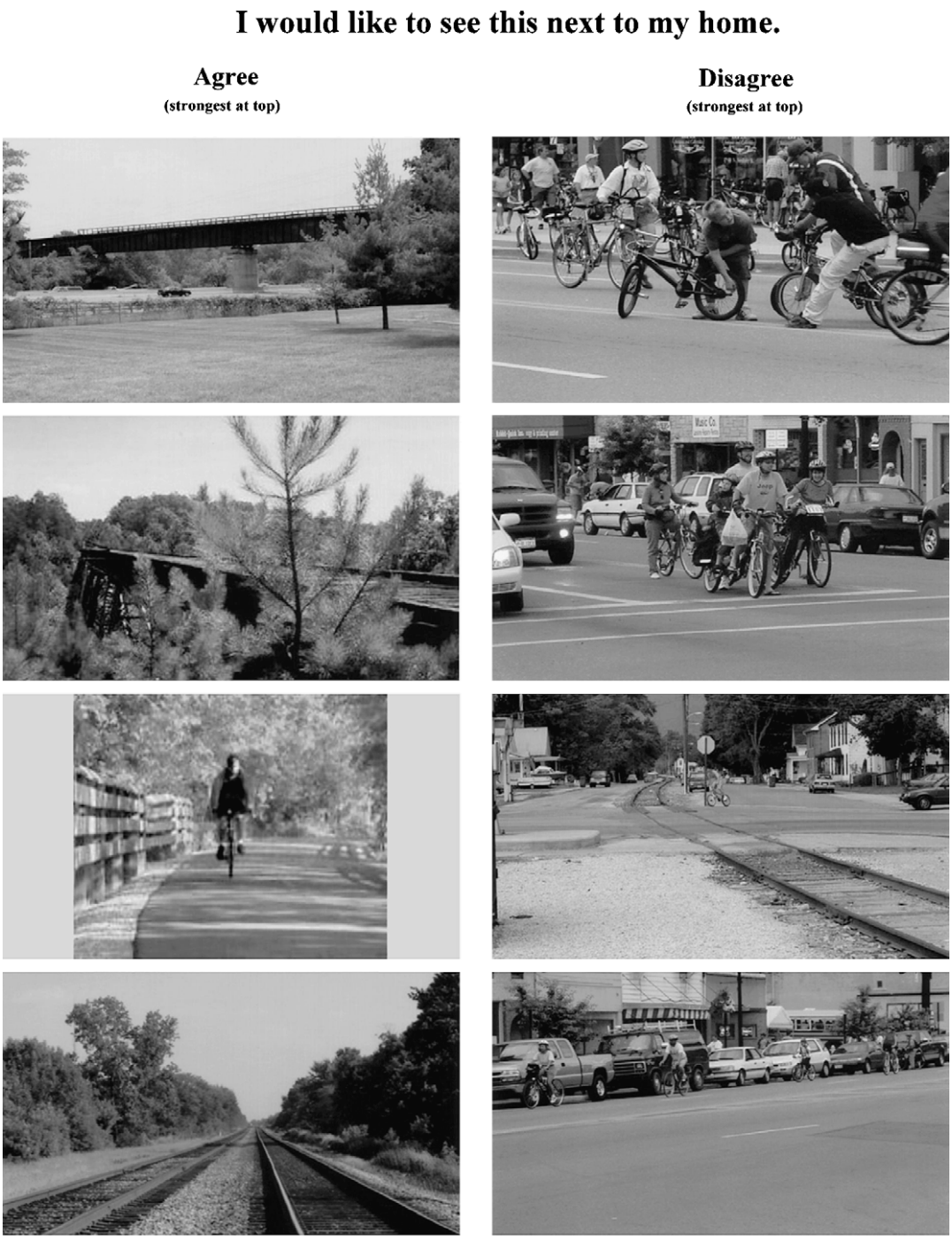

Fig. 5. Representative sort of "next to home" Factor 2.

community support for trail development, and we expected to find very favorable opinions about trails in the community (but not close to home), or at least a greater commonality of opinions.

The results of our analysis show that the community sorts were much more diverse and complex than the "next to my home" sorts. While trails are still cast in a favorable light, there is less agreement on why they are favorable. What people do not want to see in their community is arguably more important in these community sorts, and what shows up as unfavorable in the sorts can be related to broader trends in community change, which are directly related to the development of recreational trails. We extracted and found three significant factors in our data: the strongest factor (with an eigenvalue of 6.8, explaining 33% of the variance), a second factor (with an eigenvalue of 1.8, explaining 21% of the variance) and a third factor (with an eigenvalue of 1.4, explaining 9% of the variance).

The most representative and defining sort for factor 1 is shown in Fig. 6. This defining sort, and other similar sorts help us to define this factor as very similar to the strong first factor in the "next to my home" sort: "trails and green spaces are better than rails and industrial spaces." Factors 2 and 3 in the Delaware sort are represented with defining sorts shown in Figs. 7 and 8. These two factors are related but expanded forms of the second factor in the "next to my home" sort. Factor 2 reveals a preference for trails because of safety concerns: one defining sorter discussed the problems of mixing bicyclists in traffic. Factor 3 reveals a preference for trails in opposition to urban development (roads and industrial and service landscapes).

The three factors from the community sort may suggest more of an emphasis on what participants do not want to see in Delaware as a community. Trails are favorable, but

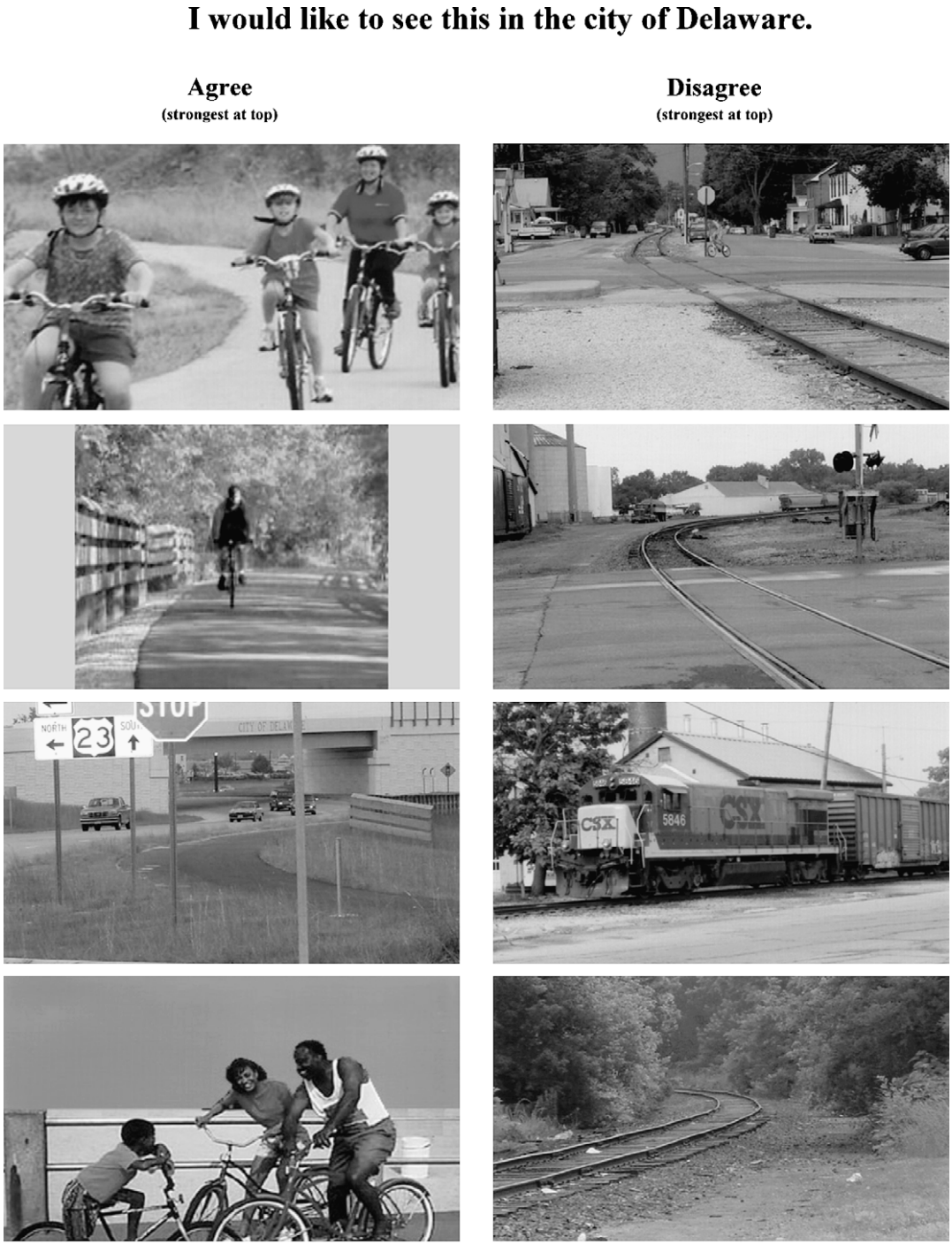

Fig. 6. Representative sort of "In the City of Delaware" Factor 1.

Fig. 7. Representative sort of "In the City of Delaware" Factor 2.

important concerns about development (roads, safety, commercial development, etc.) play a more significant role than they did in the "next to my home" sorts. This study suggests that there is much more going on at the community level than the rails-to-trails literature suggests, and that what is going on may be a strong sense of civic duty and concern about community change in general. The key may be to link recreational trail development to the broader issue of community change, and from there assess what trails mean in this broader context, and why trail development may incite concern, if not conflict, at a community level.

7. Integration of Q method results and qualitative data in PPGIS

While the above section discusses the results of the Q analysis, it is also important to consider how this complex

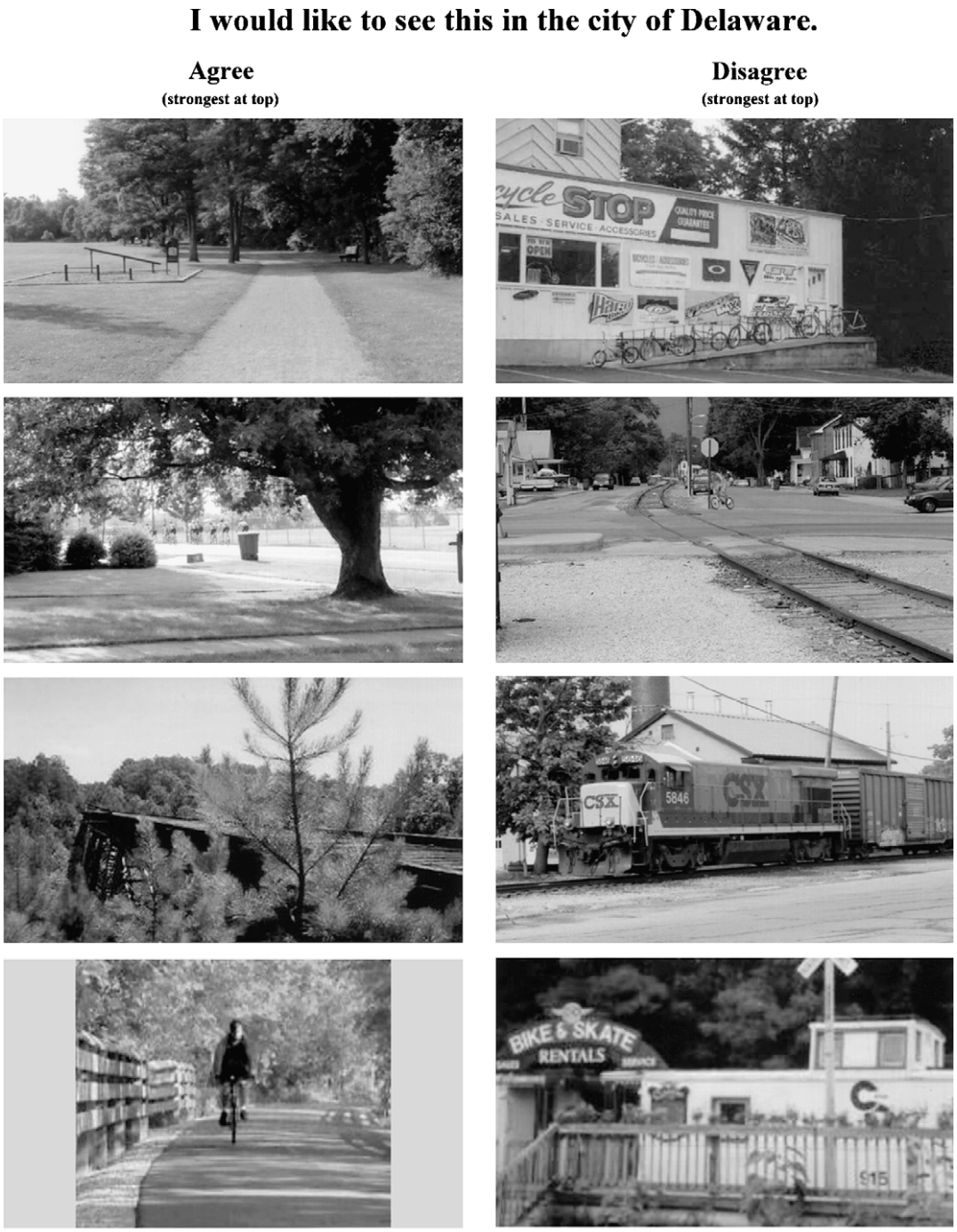

Fig. 8. Representative sort of "in the City of Delaware" Factor 3.

qualitative data can be represented in GIS for use in trail planning discussions. As the PPGIS literature suggests, incorporating views from community members in GIS is important. Furthermore, PPGIS research stresses that participant questions and community concerns should drive PPGIS mapping and analysis projects. With these two points in mind, we created a GIS analysis informed by participant concerns about community development in general and trail development in particular. We hoped to highlight which proposed trail locations were favorable for development and also include some of this qualitative information in GIS. The GIS analysis described in this section focuses only on the "next to my home" picture sorts due to space and time constraints. However, the "in my community" data can be explored more carefully in a future study.

In the "next to my home" sorts, two significant factors were identified. The two factors from the "next to my home" sort suggest that trails be placed in opposition to

urban development. Factor 1 sorters oppose being near a manufacturing-based landscape of production and industry. Given that factor 1 represents an opposition to industrial landscapes, we can use a GIS buffer analysis on proposed trail development sites to identify locations that have a high presence of industrial land uses. By creating a buffer analysis of these land uses relative to proposed trail locations, we can show which trail locations are most favorable to study participants based on the trail replacing or minimizing a less favorable industrial land use. The GIS buffer analysis thus is informed by Q method results and also represents qualitative data collected from participants.

Factor 2 sorters oppose service-based landscapes of consumption and commercial development. Similar to the results of factor 1, we can integrate factor 2 results into GIS based on spatial analysis techniques that identify unfavorable commercial land uses located near proposed recreational trail sites. In identifying these commercial land uses, we can show which portions of trails might generate community support due to negatively viewed adjacent land uses. It is important to note that we are not attempting to undermine trail development; rather, we are trying to identify trail locations that are most favorable for development based on their location and subsequent replacement or minimization of unfavorable commercial and industrial land uses identified by the majority of study participants.

Including the two significant factors from the "next to my home" sorts into GIS was done by creating 45.72 m (150-foot) buffer zones (as suggested by the city recreational planner) around all proposed recreational trail sites in the City of Delaware. These buffer zones identify all commercial and industrial land uses that are in close proximity to proposed trail development locations. This analysis, based on participant comments, suggests that if commercial or industrial land uses lie within 45.72 m of the trail site, then the trail location is favorable since it is replacing an unwanted land use.

Fig. 9 shows all proposed recreational trail locations and industrial land uses (Q factor 1). As evident from this map, there are significant portions of trails that are situated on or near current industrial land uses. In particular, the Springfield Branch Trail and its smaller connecting trail spurs and the Liberty Avenue Trail have a large amount of industrial land uses within a 45.72 m radius of the trails. Based upon the majority of participant comments, these land uses could be replaced or minimized with new trails. These new trails would not only create new recreational opportunities in the city, but also weaken the impact of other unfavorable land uses.

Fig. 10 shows all proposed recreational trail locations and commercial land uses (Q factor 2). As shown on this map, there are significant portions of trails that are situated on or near current commercial land uses. In particular, the CSX Loop North and South and the Stratford Trail have significant commercial development nearby, which suggests that these trail locations can be viewed as favorable based on the fact that these locations minimize the impact of unwanted commercial land uses.

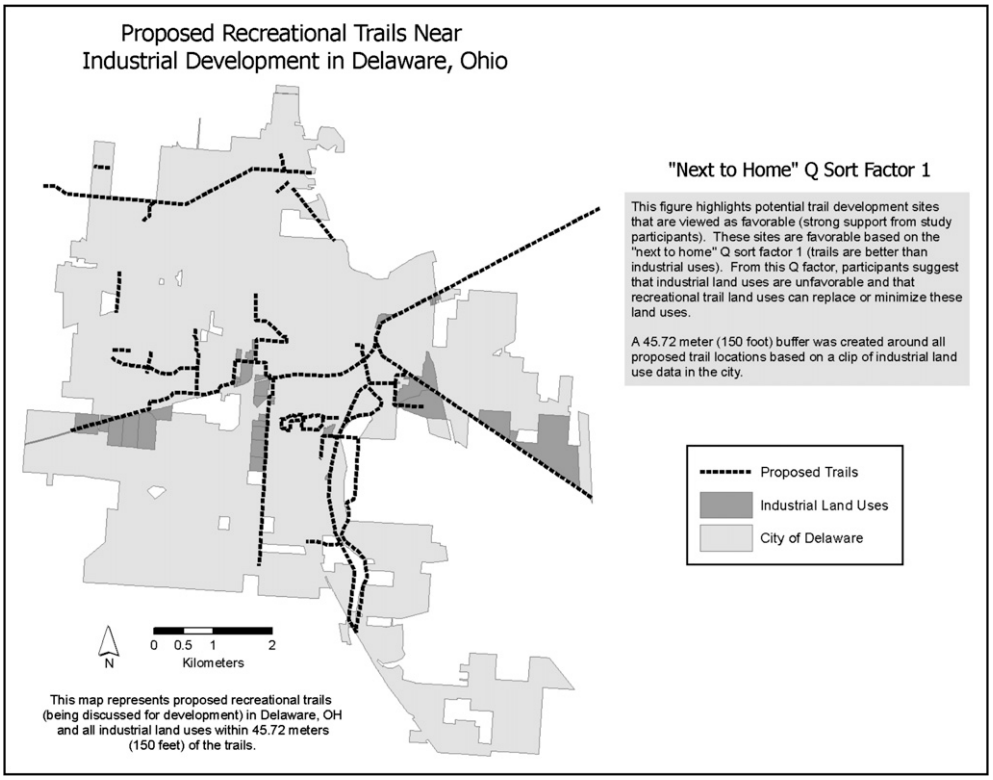

Fig. 9. GIS analysis informed by "next to home" Q Sort Factor 1.

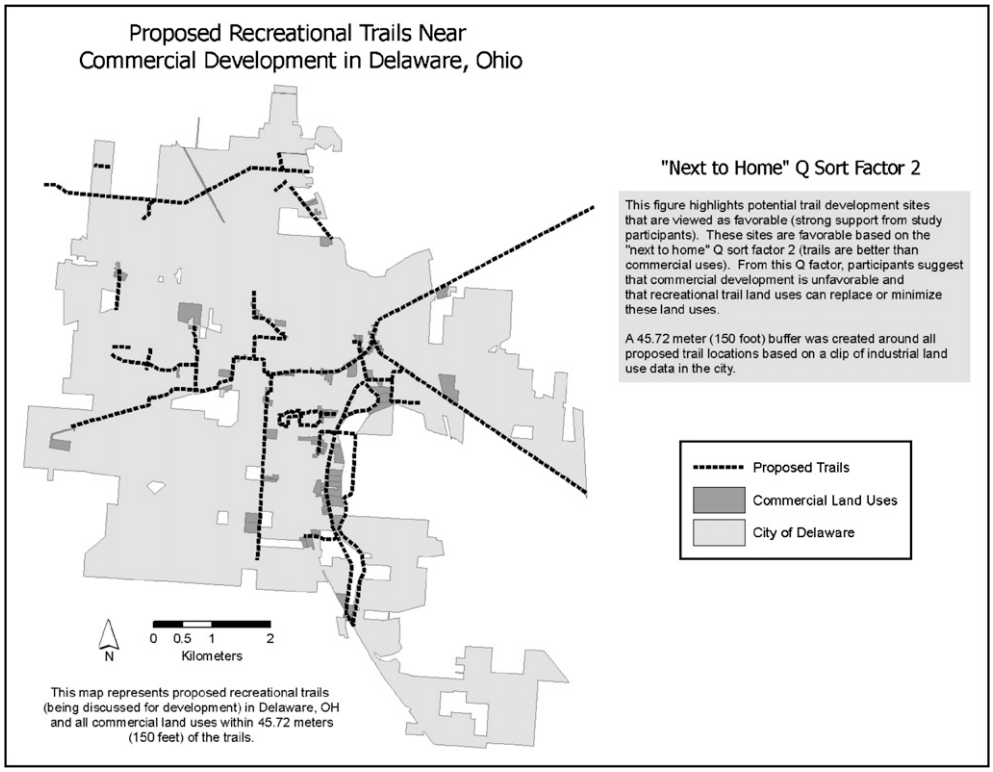

Fig. 10. GIS analysis informed by "next to home" Q Sort Factor 2.

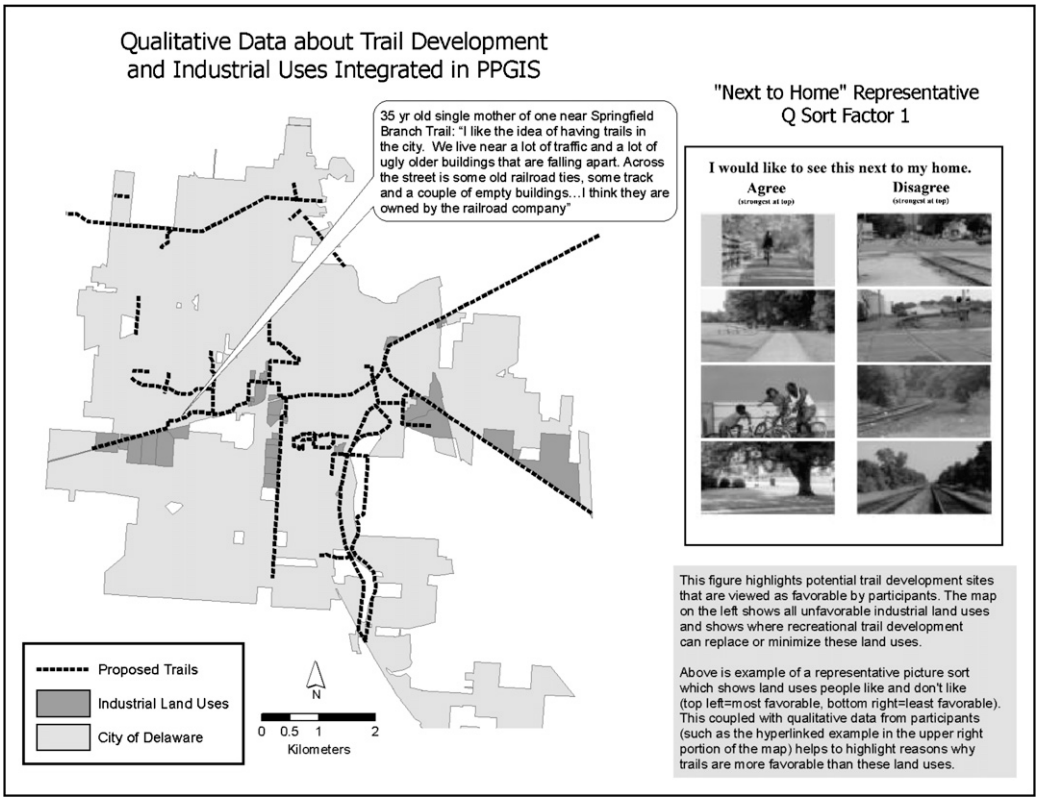

Fig. 11. PPGIS analysis based on "next to home" Q Representative Sort Factor 1.

Fig. 11 gives an example of how the Q picture sorts and qualitative data from participants can be included in PPGIS. This figure takes information discussed with participants in the "next my home" sort and is then added

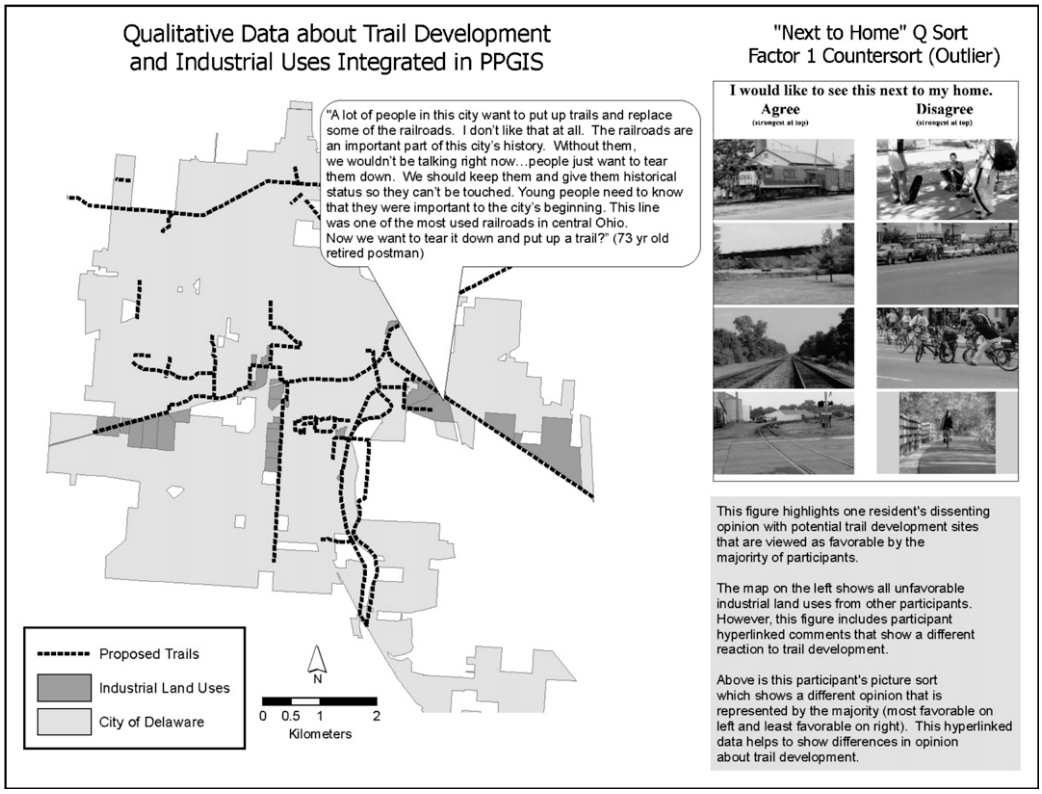

Fig. 12. PPGIS analysis based on "next to home" Q Counter Sort Factor 1.

in GIS through hyperlinks within the attribute table for the particular trail location. The example in Fig. 11 highlights a representative sort of trail development, which shows discontent with industrial land uses (Q sort factor 1) and a favoring of trails. Factor 2 results are included in PPGIS in a similar manner, but article length constraints prohibit their discussion. A picture sort and qualitative data from participants such as this can be added into GIS for each particular trail segment to show participant reactions.

As noted earlier in the PPGIS literature review, the strength of this research is that multiple perspectives can be included in GIS. As stated in the "next to my home" results section, the majority of participants favored trails over industrial land uses. However, as the qualitative data and Q sorts suggest some participants do not agree with the replacement of industrial uses with trails. Fig. 12 highlights such dissenting opinion. Including such information in GIS allows for the representation of multiple reactions to trail development and community change.

Each of the figures above and the accompanying qualitative data in GIS are useful for anticipating which proposed trail locations are favorable for development. These maps are important in planning discussions for several reasons. First, these maps help to identify which portions of trails are near land uses that are viewed as unfavorable. Identifying these locations can help show where public support for trail development occurs. Second, these maps represent qualitative data that give context to the reasons behind support or discontent with proposed trail locations. GIS analysis that ignores views of community members misses the complexity of reasons behind support or opposition to recreational trail development. By including PPGIS-based spatial analyses with Q method picture sorts and qualitative data highlighting unfavorable land uses near proposed trail locations, we are able to better represent some of the issues that might arise in planning recreational trails in the City of Delaware.

8. Conclusions

This study used qualitative data collected from local residents and Q method to understand reactions to recreational trail development in the City of Delaware (Ohio, USA). The results suggest that geography matters in the context of trail development and potential NIMBY reactions to trails. Significant differences in the two sorts, situated at different spatial scales, reveal that proximity and location are important, although in a manner inverse to the assumptions in the writings about rails-to-trails.

The results suggest that participants share a favorable view of trails and green spaces next to their homes. It may be that the rails-to-trails literature has emphasized the reactions of a small number of disgruntled adjacent property owners, and this has fed the perception that resistance to trails is likely to occur among people living closer to trails. The rails-to-trails literature has a tendency to stress certain assumptions about proxemic reactions

against trails: adjacent landowners have selfish concerns about their safety or their property values. The response is studies that embody this instrumental logic: Studies showing no increase in crime or no damage to property values after a trail is built. It is possible that such instrumental studies will not calm trail opponents: that reactions against trails may be less about what opponents say they are about (safety, property values) and more about anxieties over broader changes in the community.

The significant but subtle differences in the community scale sort also seem to run counter to assumptions in the writings on rails-to-trails, which emphasize favorable community level response to trail development. Our study suggests that there is not the same coherent support for trail development at the community level as there is at the "next to my home" scale. While people still support trails at this scale, they do so for more complex, civic reasons. What people don't want to see in Delaware may be more important to this study, and it is possible to read a subtle (and sometimes not so subtle) story of ambivalence about community change from the community level sorts. For these reasons, using PPGIS analytical approaches that include qualitative data collected from participants and Q picture sorts highlight the multiple reactions to trail development.

As the literature suggests, trails are something most people want near their home, and the intent here is not to argue that they are bad or unpopular. But trails may arouse subtle ambiguities, particularly at the community level, and particularly in the context of a changing human landscape. Representing these ambivalences, ambiguities, and anxieties on maps is one of the more challenging and important roles for PPGIS. Our research attempts to add to this body of work by collecting qualitative data from community members and then using this information to shape GIS analysis. As mentioned in the PPGIS literature, GIS analysis that ignores people's views will miss much of the complex and fascinating human geographies that exist in any place. This research has shown that qualitative place-based studies can tap into what is arguably the most vital aspect of any place-based work, situating geographic tools and research in a real geography, and providing insight and understanding about the complexities of situated geographic change.

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