U.S. Community Forestry Research Fellowship 2003 Final Report

Social and Economic Drivers Affecting the Community Forest and the Dynamics of Residential Development in Cedar Rapids, IA

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Research problem and goals of research.

Cedar Rapids, Iowa is the state's second largest and second fastest growing metropolitan area. Development in the city and its surrounding area are growing at an incredible rate exceeding the actual population growth. This is raising considerable concern among citizen groups and city officials. The Cedar Rapids area resides along the Cedar River corridor and contains abundant gallery forests that are important for both water quality and biodiversity. However, discussions with citizens, developers, and government officials indicated that there were considerable barriers to the implementation of conservation design. This project was initiated to study these barriers and the possible social and economic effects of using conservation in subdivision design, in particular the use of open space and low-impact practices and features.

The main goal of the study was to provide a detailed and place-based comparison of traditional residential development to conservation-oriented development concentrating on the social and economic factors related to development in the Cedar Rapids community.

I proposed to address this goal by examining the biological, sociological, and economic factors of conservation in residential housing and creating a well-rounded view of conservation development that would better explain the benefits and costs of its use. First, I sought to examine the biophysical differences in subdivisions through floristic and hydrologic analysis. Evaluation of changes in species composition and abundance through each part of the development cycle would provide information on the pressure that development places on surrounding forests. The examination of hydrologic changes during and after development and the differences between development types would provide data on the effect of development on stream function and health.

Next, I proposed examining the economic factors surrounding conservation development by analyzing the transactional and demand information for six subdivisions within the metropolitan area. Three of these subdivisions contained conservation features and three were traditional subdivisions. I sought to examine the differences in demand, sale prices, and transfer records. I also proposed to examine the cost and benefits of conservation design through the examination of differences in development costs through analysis of grading and labor charges.

Lastly, I proposed to study the effect of conservation design on resident quality of life by surveying residents within the neighborhoods used for the economic section of the project.

Changes in Project Design from Original

As my research and data collection progressed, I found that it was necessary to make some changes to the research design. First, after an extensive literature review and discussion with members of my M.S. study committee, I decided to increase the scope of the social section and explore resident's sense of community and their participation in neighborhood groups. Both of these measures are closely related to quality of life and are important social health concepts.

Second, I decided to focus all of the study assessments solely on the six subdivisions that were selected for the economic and social sections. This allowed for a more concentrated analysis that would enable better comparisons among biologic, economic, and social factors.

Third, I decided not to conduct the cost assessment of development for several reasons. A primary reason was the difficulty of obtaining appropriate data. In order to make comparisons of savings or costs, I would need very large datasets for each subdivision derived from many different companies and individuals. Costs related to grading and other activities are very site-specific, making comparisons of changes in development costs due to conservation design very difficult. I decided instead to examine the barriers to the use of conservation in development. I approached the topic of development costs from a different perspective. Instead of focusing on individual subdivision costs, I began to examine developers' willingness-to-accept costs and development incentives. Thus, rather than studying the final product of development, I began to focus on the process of development. I set up a series of local and regional developer interviews and a statewide developer survey to study the attitudes and economic perceptions that influence developer actions.

Field experience, data collection, and participatory research

My field experience was overall a successful experience that provided excellent opportunities for me to meet and work with citizens, community partners, developers, and city officials. I resided in Cedar Rapids for three months over the summer of 2003 and continued to work in the area throughout the remainder of 2003 and the first half of 2004.

The study began with the selection of six different study subdivisions to study the economic and social differences in residential design. Three subdivisions were of traditional subdivision design (TSD) and three subdivisions contained conservation features (CSD). I should note that there are no "true" conservation subdivisions in Cedar Rapids. However, there are subdivisions that contain significant conservation features that resemble conservation subdivisions. In the selection process, I used a number of community partners to help chose the locations and I also controlled for other factors in the selection process (i.e. mean age of homes, assessed value of homes, and mean size of homes).

Biophysical Assessments

I began biophysical assessments by completing a GIS analysis using Linn County property data that defined and quantified the amount of open space available in each subdivision. I then completed a vegetative assessment for each neighborhood by walking through both the housing and open areas and counting plant species and abundance. CSDs were divided into developed and undeveloped areas which were used to compare between inhabited and natural areas. The species richness, percentage of native and exotic species, the coefficient of conservatism and the floristic quality index for each of the subdivisions and their open space areas were computed. Next, the streams of two subdivisions were monitored for the summer of 2004 to compare the stream condition and runoff quantity from a

traditional subdivision and a conservation subdivision. These samples were used to measure sediment load, nitrate levels, and dissolved phosphorus.

Economics

Economic data was collected using two different methods. First, for the transactional and sales assessments, databases from the City and County assessors' offices were used to collect first and 2004 assessment values, total number and value of sales and length between sales. The Iowa Realtors MLS database was used to determine the average days on market for property in each subdivision. For this part of the economics section of the project, I used houses built only in 1997/1998. The City of Cedar Rapids only retains assessment data for a period of 5-6 years so the oldest available first assessment at the time I collected the data was for the 1997/1998 assessment period. The City and County make new assessments every odd year. I choose to use the oldest possible assessment to try to capture the maximum 3 assessment periods in my analysis.

Second, a survey was hand-delivered to randomly selected residents living in each of the six different subdivisions. This survey solicited consumer preferences for and perceptions of open spaces, and their willingness-to-pay for having such features in their subdivisions.

Social Indicators

Social indicators were measured using the same hand-delivered resident survey from the economic section. Sense of community was measured using the short-form Sense of Community Index (SCI) scale (Perkins et al, 1990) based on the McMillan and Chavis (1986) model of Sense of Community. Quality of life was measured using social indicator questions derived from the Community Well-Being Questionnaire (Christakopoulou et al, 2001), which breaks quality if life into nine sections: satisfaction with the built environment, satisfaction with environmental quality, personal safety, informal interaction, satisfaction with services and facilities, community spirit, income sufficiency, decision-making process, and place attachment. Participation in neighborhood groups was asked directly using yes/no questions.

Developer Attitudes and Perceptions

I conducted a series of one-on-one on-site interviews with developers through Cedar Rapids and the Central Iowa region. These interviews focused on perceived consumer demand, site selection, low-impact design, perceived costs and benefits, willingness-to-accept, regulations, public policy, and market issues. Using these interviews, I created a developer survey that was sent statewide to confirm the information gathered from the interviews and test for differences in developer perceptions across the state.

Participatory Research

The project was not as participatory as I would have desired. The type of data collection and analysis involved did not lend itself to a complete participatory approach. However, partners were engaged in research whenever possible and will be increasingly involved throughout the presentation phase of the study. Most of the community partner participation happened before the current study through the use of focus groups and a task force that help to outline the direction of study in Cedar Rapids. Their help was invaluable in defining the community's research needs and set the groundwork for this study. As previously mentioned, however, community partners were invaluable in identifying study sites, and

also identifying additional important contacts in the city for interviews and other necessary information.

Preliminary findings and analysis and their relationship to original goals/hypotheses.

Biophysical Assessments

The GIS analysis indicated a fairly large difference in percent open space availability between our study subdivisions (Table 1). Most of the open space available within the conservation-type subdivisions was forested with the exception of Conservation Subdivision 3, which contained only open fields.

Table 1: GIS Analysis of Open Space Availability

Subdivision	Total Acres	Open Space Acres	Percent Open Space
Conservation Subdivision 1	145.8	73.9	51%
Conservation Subdivision 2	83.1	26.8	32%
Conservation Subdivision 3	36.0	11.1	31%
Traditional Subdivision 1	18.8	2.9	15%
Traditional Subdivision 2	67.2	1.9	3%
Traditional Subdivision 3	34.0	5.6	17%

Results of the floristic analysis indicate that developed areas in both CSD and TSD subdivisions are similar with high species richness, but also a high percentage of exotic species, a lower coefficient of conservatism, and a lower floristic quality index than undeveloped areas in CSD neighborhoods (Table 2).

Table 2: Floristic Assessment of the Six Study Neighborhoods

	Undeveloped Areas			Developed Areas			Developed Areas		
	CSD 1	CSD 2	CSD 3	CSD 1	CSD 2	CSD 3	TSD 1	TSD 2	TSD 3
Species Richness	94	113	115	97	96	162	108	132	115
Percent Native Plants	32	72	83	19	25	25	27	22	23
Percent Exotic Plants	51	20	11	58	55	59	55	61	56
Coefficient of Conservatism	1.2	2.32	3.85	0.88	1.05	0.99	1	0.84	1.01
Floristic Quality Index	6.58	20.87	37.74	3.71	5.15	6.29	5.39	4.53	5.24

The results from the hydrologic portion of the study are still pending. I also have comparative water samples of subdivisions with and without conservation features that will be analyzed by January 2005.

Economics

There were no significant differences found between traditional and conservation subdivisions for any of the sales or transactional data for the houses selected in our study areas. These results were surprising. I expected the CSDs to have a greater percent difference in both the assessment comparison and the assessment/sale comparison. I also expected the CSDs to have lower number of sales and a higher number of years between sales. The houses in the CSDs appear to have a much lower mean days on market value as expected; however, the TSD days on market data is too noisy to be certain.

It appears that conservation in subdivisions has little effect on transactional variables, at least in the short term. Previous research has show differences in assessment values of traditional and conservation subdivisions in other areas of the country (Lacy, 1990). However, those analyses used a significantly longer study period of 21 years.

Table 3: Sales and Transactional Data for Houses Built in 1997/1998

	TSD		CSD		
	Mean	**Std.Dev.**	**Mean**	**Std.Dev.**	**p-value**
Percent Change from First to 2004 Assessment	16.35	2.27	15.85	1.22	*NS*
Percent Difference in First Assessment and Sale	0.099	0.027	0.099	0.017	*NS*
Total Number of Sales	1.48	0.21	1.47	0.13	*NS*
Average Number of Years Between Sales	3.43	0.31	3.27	0.69	*NS*
Average Days on Market for Housing Sales	123.04	52.44	75.47	11.96	*NS*

[NS = Not Significant]

The results of the economic section of the survey suggest that there are little differences in perception and desire of conservation features (Table 4). Surprisingly, TSD and CSD residents share approximately the same perceived level of open space availability. They also share about the same desired level of open space.

There was a difference between residents from conservation and traditional subdivisions for consumer stated willingness-to-pay (Table 4). While both sets of residents appeared to be willing-to-pay a base $2000 for their desired level of open space, CSD residents showed a significantly higher maximum willingness-to-pay. This is interesting especially considering the CSDs' already high level of open space. This data suggests that CSD residents place more value on their open spaces than TSD residents. To determine if this is an effect of life around conservation features or a predisposition for open spaces would require deeper market research.

It is also interesting to note that while CSD residents expressed a greater willingness-to-pay for conservation features, they did not have to pay any more for the features that they already have over those of TSD features. Overall housing and demographic data for households surveyed (Table 8) indicates that assessed value, housing size, and housing build date was statistically the same for all subdivisions. The current housing market in Cedar Rapids does not place a premium on conservation

features (e.g. Table 3). This suggests that there is a potential untapped market that could be developed for conservation subdivisions in the Cedar Rapids area.

Table 4: Resident Open Space Preference and Willingness to Pay

	TSD		CSD		
	Mean	**Std.Dev.**	**Mean**	**Std.Dev.**	**p-value**
Perceived Level of Open Space Available	2.85	0.63	4.39	1.89	*NS*
Desired Level of Open Space Available	4.94	0.21	5.98	1.23	*NS*
Difference Between Perceived and Desired Levels	2.09	0.65	1.58	0.78	*NS*
Willingness to Pay $2000 for Desired Level (1=Yes, 0=No)	0.53	0.16	0.72	0.09	*NS*
Maximum Willingness to Pay for Desired Level ($)	1851.54	109.71	4370.26	978.14	**0.0114**

[Perceived and Desired Levels of Open Space were measured on a 1-10 scale with 10 having the most open spaces]

Social Indicators

The results from the sociological section of the resident survey indicated that conservation subdivision residents have a statistically significant greater perceived sense of community than residents of traditional subdivisions (Table 5).

Table 5: Sense of Community Index

	TSD		CSD		
	Mean	**Std.Dev.**	**Mean**	**Std.Dev.**	**p-value**
Sense of Community Index	25.9	1.4	22.5	1.00	**0.025**

[A Lower Number Indicates a Stronger Response]

The quality of life indicator results also suggest that CSD residents have a greater perceived quality of life, a greater attachment to their neighborhood, and a greater sense of belonging to their neighborhood (Table 6). There was no difference between the neighborhoods in how residents felt their quality of life was changing, with all respondents indicating that it was changing for the better. CSD residents also reported a greater feeling of effectiveness within their neighborhood (Table 6). These results help support and explain the difference in sense of community among residents as attachment, efficacy, and belonging are important components of a person's perception of their community.

While there were no significant differences in most of the quality of life indicators, there were some surprising results. The open space areas in conservation subdivisions provide for recreational opportunities; however, both traditional and conservation residents indicated only a moderate availability of recreation in their neighborhoods. Indicators dealing with neighborhood aesthetics and environmental quality also showed no significant differences even though it was expected that CSD residents would indicate a more positive response.

Safety was another issue for which it was expected respondents would express a difference between traditional and conservation design, although they did not (Table 6). Most of the open space features in our study areas were forested areas that are not well lit. This could possibly lead to some concern over personal safety. The results, however, indicate that both TSD and CSD residents felt safe both inside and outside their houses.

Table 6: Quality of Life Indicators

	TSD		CSD		
	Mean	**Std.Dev.**	**Mean**	**Std.Dev.**	**p-value**
Overall Quality of Life	1.7	0.1	1.5	0.1	**< 0.01**
How Quality of Life is Changing	1.8	0.2	1.8	0.1	NS
Attachment to Neighborhood	2.4	0.2	1.9	0.1	**0.02**
Belonging to Neighborhood	2.3	0.2	1.9	0.1	**0.07**
Living in Neighborhood Long Time	2.0	0.1	1.8	0.2	NS
Too Much Traffic	3.6	0.3	3.5	0.2	NS
Acceptable Air Quality	1.6	0.1	1.6	0.2	NS
Acceptable Noise	1.9	0.4	1.8	0.3	NS
Neighborhood Cleanliness	1.3	0.1	1.4	0.1	NS
Good Road Condition	1.5	0.2	1.7	0.3	NS
Recreational Opportunities	2.5	0.9	2.4	0.3	NS
Close to Good Schools	1.5	0.1	1.7	0.2	NS
Good Access to Shopping	1.8	0.6	1.7	0.2	NS
Visit with Neighbors Often	2.5	0.4	2.4	0.3	NS
Speak with Neighbors Often	2.2	0.1	2.3	0.2	NS
Would Live Somewhere Else if Richer	1.5	0.3	1.5	0.1	NS
Enough Money to Live Well	3.4	0.2	3.4	0.2	NS
Resident Involvement in Neighborhood	2.3	0.2	2.1	0.3	NS
Residents Can Affect Neighborhood	2.2	0.1	1.9	0.0	**0.01**
Safety at Home	1.4	0.3	1.3	0.0	NS
Safety Walking	1.4	0.3	1.3	0.0	NS

[Reponses were recorded on a 1-5 Likert scale with lower response indicating greater agreement]

Overall, the results of the organizational participation analysis were also surprising as there were no significant differences found between responses of residents in TSDs and CSDs (Table 7). Both CSD residents and TSD residents indicated low levels of membership and contribution to neighborhood associations and environmental causes or groups.

Table 7: Neighborhood Organizational Participation

	TSD Mean	Std.Dev.	CSD Mean	Std.Dev.	p-value
Membership in Neighborhood Association	0.03	0.03	0.25	0.36	NS
Membership in Environ. Cause or Group	0.05	0.08	0.02	0.08	NS
Contribution to Environ. Cause or Group	0.18	0.16	0.28	0.04	NS

However, closer examination of the results at the individual subdivision level, residents in one CSD did express a significantly greater level of participation in their neighborhood association (Table 7a). This result suggests that the type of open space ownership is a factor in neighborhood association participation. Open spaces within all of the TSDs and two of the CSDs were privately held by residents or were given to the city of Cedar Rapids. All of those subdivisions exhibited low levels of neighborhood participation. One of the CSDs had open areas that were communally held and residents in that subdivision showed a strong amount of participation and investment in their neighborhood association. This suggests that while the presence of open spaces within the neighborhood has little or no effect on association membership, communal ownership of those open spaces does.

Table 7a: Percent Involved in Neighborhood Association by Neighborhood

Conservation Subdivision 1	**66.7%**
Conservation Subdivision 2	**0.0%**
Conservation Subdivision 3	**9.1%**
Traditional Subdivision 1	**5.0%**
Traditional Subdivision 2	**4.2%**
Traditional Subdivision 3	**0.0%**

The lack of involvement or contribution to environmental groups or causes was surprising. One of my initial thoughts was that participation in environmental groups would be positively correlated with living in CSDs either through residents' initial house selection based on environmental concerns or post-selection with residents' immersion in a conservation environment. However, the results suggest that open spaces and involvement with environmental causes have no connection.

Survey Demographics

There were no significant differences for demographic variables between any of the subdivisions studied. It should be noted that mean income values for both TSDs and CSDs are above the $70,567 average income for residents of the city overall (provided by the Cedar Rapids Chamber of Commerce Report, 2004).

The sample was biased toward white, educated individuals earning an upper-middle class household income. However, this is a direct result of controlling the housing price range constant to include the subdivisions with conservation features. Furthermore, the overall demographic makeup of Cedar Rapids is 94% white and 68% college educated (Cedar Rapids Chamber of Commerce, 2004). I would

like to see further study in the future that includes a wider range of races, incomes and education levels.

Table 8: Demographics and Housing

	Overall		TSD		CSD		
Number of Surveys Delivered	296		146		150		
Number of Respondents	150		67		83		
Percent Returned	51%		46%		55%		
	Mean	**Std.Dev**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**p-value**
Percent Male Respondents	54%	7%	55%	9%	53%	6%	NS
Percent Respondents by Race							
White or Caucasian	96%	7%	94%	10%	97%	2%	NS
Black or African-American	1%	2%	1%	3%	0%	0%	NS
Hispanic	2%	4%	3%	5%	1%	2%	NS
Asian	1%	2%	0%	0%	1%	2%	NS
Native American	1%	2%	0%	0%	1%	2%	NS
Indian	1%	1%	0%	0%	1%	2%	NS
Age of Respondent	44	2.8	47	1.9	44	5.0	NS
Number of Persons in Household	3.5	0.5	3.3	0.5	3.6	0.6	
Number of Children at Home	1.3	0.5	1.2	0.4	1.4	0.6	NS
# of Children in Private/Homeschool	0.1	0.1	0.1	0.1	0.1	0.1	NS
Education Level	4.8	0.5	4.5	0.6	5.0	0.2	NS
Income Level	4.7	0.4	4.6	0.4	4.8	0.4	NS
Years Living at Residence	5.5	1.8	5.1	2.1	5.9	1.8	NS
Year House was Built	1996	2	1997	3	1995	2	NS
2004 Assessed Value of Home	$221,587	$21,187	$223,591	$23,269	$219,583	$23,848	NS
Size of House (Sq. Ft)	2294	201	2328	120	2260	288	NS

[The education level of 4 indicates a 2-year college degree and a level of 5 indicates a 4-year college degree. An income level of 4 indicates an income of $75,000-$100,000 and a level of 5 indicates an income between $100,000 and $150,000.]

Developer Attitudes and Perceptions

The analysis and collection of the developer survey and interviews is ongoing, however, a considerable amount of information regarding developers' perspectives on low-impact design, regulations, and consumer preferences has been compiled and will aid immensely understanding the subdivision creation process from a developer's perspective. This information will be critical in finding ways to communicate across what appear to be ideological boundaries.

Benefits of research to the community.

The results of this project will benefit Cedar Rapids (and other communities) in several ways. First, it provides evidence that conservation in subdivision design can have an effect on citizen's sense of

community, quality of life, and participation and identification with local groups. These are issues that community leaders and planners struggle with on a daily basis. This study demonstrates a viable option for policy change that officials can consider which has both social and environmental benefits.

Second, the results offer important information to residential developers and local community action groups. These results imply that there is an untapped consumer willingness-to-pay for open space features in subdivisions and that subdivisions with these features sell as quickly and for as much as regular subdivisions. Other studies have shown that using conservation features can decrease development costs. Developers may want to take advantage of cost savings and consider advertising the availability of conservation areas. Local interest groups can use this information in their community education efforts to inform consumers about the use of conservation features in subdivisions. An informed public demanding conservation in subdivision design would be the best catalyst for change in the housing market.

Lessons learned.

My experience with this project has reiterated several important principles that I believe apply particularly to community research. First, community connections and networking are crucial to successful research. This study would have been impossible without the assistance of contacts in local government, design firms, non-profit organizations, and interest groups. These relationships helped to provide information that was normally not publicly available, including experiential and place-based knowledge that is unique to participants. For example, information from a local soil conservationist and local landscape architects that were part of the study task force was particularly useful in site selection and history, which greatly reduced the amount of time that was required for research and helped to increase the quality of the project's study areas. Contacts also helped to identify other knowledgeable people and provided connections to those that could assist in more difficult problems or help with specific information. Our GIS data for Cedar Rapids was obtained through a contact that had a personal relationship with the county planning director. Without that contact, the data would have been very expensive to acquire.

One particularly important type of community connection is the community partner. Partners have a personal stake in the research, and can provide support and direction for your research. Our community partners were fundamental in providing the groundwork for and strongly supporting this study as well as previous projects. Perhaps the greatest aspect of a community partnership begins when the project ends. With a solid partnership, I have found that the results of the study have a built-in and receptive audience. Allies in the community help guarantee the usefulness and implementation of results. I would like to add that I have found that with controversial subjects, such as those dealing with property rights, use and regulation, it is important to partner with people and organizations on both sides of issues and from all facets of the community if possible. A multi-sided alliance is much stronger and more accepted that one coming from only one perspective. That is not to say that a researcher must remain neutral in the face of evidence, but must be careful to present results that are backed by sound science and not sever ties that could be beneficial in the future.

I have found that it is important to know the territory that you are studying and that the CFRF program is prudent in its requirement for fellows to live within their community. Living in Cedar Rapids allowed me to better understand the political climate and the dynamics within each part of the city. I was able to familiarize myself with important issues and my residence provided a personal stake in local events. This personal association helped me to better connect with the other residents that I met or developers that I interviewed. I was able to talk about specific events that were happening in Cedar

Rapids from the standpoint of having experienced those events, which was a perspective that I would not have had if I had been an outside researcher. I was also able to meet with contacts more frequently as well as create new relationships with others that I am sure will be useful in the future.

The subject of identity and status is an area that I am still learning from. Because the research that I conduct has a large social component, it deals with studying and connecting with many individuals. Each of these individuals carries different personal perceptions of the environment, science, social research, the researcher, and the university. It is important to be empathetic for each person's level of trust and comfort with these subjects. I found this to be particularly true when dealing with contentious subjects like environmental quality. For example, some individuals respond well to Iowa State University, but are distrustful of my department because of the use of the phrase Natural Resources in the title (they have had bad experiences with the state Department of Natural Resources, which has a regulatory arm). I have learned to be careful with the use of identity. However, it can be advantageous to exploit a connection with a university. For example, I was able to obtain assessment and housing data from the city with little difficulty because I was a university researcher. I have also learned that people respond better to a researcher when a personal identity is expressed. Showing a personal stake in your research when dealing with individuals can help generate a more positive response.

Finally, I have learned to expect change and roadblocks in research. There were some tasks that I had hoped to complete with this research that proved more difficult to complete than I had originally anticipated. It was then necessary to adapt to change, refocus on the strengths of the research project, and find new ways to approach the research problem. I think that I have been successful in addressing my study goals even though the path that I took was somewhat different than originally planned.

Suggestions for the CFRF Program

I think that the CFRF program is an excellent program and that it has provided me with opportunities that I normally would not have had. I am thankful for the chance to be part of the program knowing that without its support, I would have had a much more difficult time completing my research. The only suggestion that have for the program is that I would like to have had the CFRF workshop sooner. The conference presented some great research ideas that I would have like to have been able to implement at the beginning of the project especially those dealing with participatory research.

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