LANDSCAPE AS TEXT:
A SOCIOGEOGRAPHIC STUDY OF
THE SANTA CRUZ RIVER
WITHIN THE VICINITY OF TUCSON, ARIZONA

by
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For Philip
whose support and encouragement never waivered
even in the most trying circumstances.
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ABSTRACT

The Santa Cruz River, in the vicinity of Tucson, Arizona, includes one of the oldest continuously inhabited sites in the United States. Changes in the physical landscape of the river and its floodplain, and in the social signification of the landscape, can be classified within four distinctive time periods: before 1890, between 1890 and 1920, between 1920 and 1974, and after 1974.

Structuration theory and a landscape-as-text approach were employed to discover and interpret how the social framework, natural events and processes, and the landscape itself interacted ecologically to influence and change each other within each of the four identified time periods.
CHAPTER 1

INTRODUCTION

The evolution of the landscape of the Santa Cruz River in the vicinity of Tucson, Arizona provides a unique resource for understanding the ways in which landscape reflects, and interacts with, the social framework and physical environment of a given locality. With a history of over five thousand years of occupation on the floodplain of the Santa Cruz River, from prehistoric cultures through Hohokam and Piman to Spanish, Mexican, and American dominance, the stretch of the river running through Tucson provides a rich document of life in the area. The changes in the landscape over time provide insight not only into the prevalent land uses during various periods of development, but also offer a wealth of information about the ways in which the iconography of the landscape becomes redefined based on changes occurring in the unfolding of social process.

This study seeks to understand the ways in which the social, economic and political changes evidenced during several periods in the history of the Tucson Basin were played out on the landscape and how, in turn, those changes reflexively interacted with social process. In addition, the study examines the ways in which landscape change and social process have interacted with events and conditions
in the physical environment.

The desert is an ideal place to conduct such a study because the contrasts are great, and the shifts in climatic and hydrologic regimes are dramatic. Dependence on unpredictable sources of water in the desert is commonplace. Such dependence can only be ignored in rare circumstances when available water supplies are in balance with demand. Such a balance of supply and demand existed within the study area until late in the nineteenth century, when a combination of natural events, depauperation of vegetation along the river banks, over-exploitation of limited water resources, and humanly-engineered modifications in the flow regime of the river culminated in a major episode of entrenchment from which the river has never recovered. Within a span of less than fifty years, the river went from being a source of water, a place for recreation, a resource for agricultural production, and a focal point for life in the community to being a derelict arroyo lined with garbage and pockmarked with sand and gravel operations. The city, in effect, turned its back on the river and proceeded with its great expansion based on mining of groundwater.

Ignorance of the river finally gave way in the mid-nineteen seventies to a reawakened awareness of its importance to the community. This importance arose from a number of considerations, not the least of which was a
desire to revitalize the essentially moribund central business district. Also important was the cleaning up of the river so that travelers arriving in the heart of the city would not be greeted by the blighted landscape which the Santa Cruz had become. Yet another important concern was neighborhood revitalization. Many of the residences, particularly in the reaches of the river nearest the downtown area were old; some were in an advanced state of dilapidation and were so near the riverbanks that they were in considerable danger of being swept away in a flood. Finally, heightened awareness of the need to safeguard, manage, and wisely use vital resources such as water led to intensive activity in studies of the hydrologic characteristics of the river, and of groundwater-surface water interactions, recharge mechanics and characteristics, groundwater contamination problems, and the influence of human activities on all of these factors.

The availability of funds, especially from the federal government in the 1970s, encouraged city leaders to create an integrated plan which included the reclamation of the river, capture and recharge of runoff flows, utilization of effluent to conserve groundwater resources, management of storm flows and floodplain land use, and development of a linear park which would eventually run the length of the city and connect with other major recreational and open space areas, including Saguaro National Monument West,
Tucson Mountain Park, and Kennedy Park. Linkages with riverpark trails to be installed on other major stream courses in the city were to be made as well.

In the course of this study emphasis has been on person-land relationships, which has been identified as one of the four traditions of geography (Pattison, 1964). Information about the processes and interactions associated with major changes in the landscape was obtained through a combination of research techniques. A textual analysis was undertaken to discover the ways in which the landscape reflected the interactions between the river and the community in each of four major periods: before 1890, when reliance was placed entirely on surface flow and shallow wells, between 1890 and 1920 when serious efforts were undertaken to further develop surface and subsurface flows, between 1920 and 1974 when the landscape became invisible to the life of the community, and after 1974 when awareness of the river led to new attempts to create an aesthetically pleasing landscape. Archival research was used to acquire information about the history of land use and events in the area. Personal interviews with individuals active in renewal of the river provided insights which could never have been obtained merely from reading printed documents.

Synthesis of the information revealed that the interactions between inhabitants and their environment changed over time. During the pre-Spanish days, there was
a high interaction among the Native Americans with their physical environment. With the arrival of the Spaniards, a more permanent way of life was introduced, but subsistence-level activities precluded major stresses upon the natural system.

The acquisition of Southern Arizona in the Gadsden Purchase of 1853 signaled the start of more intensive development of the floodplain and of the Santa Cruz River. From the early entrepreneurs through invasion of Eastern capital and speculation by wealthy corporations to the involvement of the federal government in many aspects of land and water management, the river has been progressively more heavily exploited.

The recent interest in beautifying the landscape and turning large vacant parcels of land to productive use is but the latest expression of this process. Recent plans for park and historic site development reflect a strong trend toward commodification of the environment. The creation of a landscape which can be manipulated to promote increased wealth within certain segments of the community may turn out to be a mixed blessing. Although this study does not pretend to foretell the future of the river, it does seek to reveal the ways in which changing alliances and dominant political, social and economic trends can be influential in the development of landscapes, and how those landscapes in turn can influence future directions.
CHAPTER 2
LITERATURE REVIEW

The study of landscapes and the derivation of information about places and peoples from such study has a long tradition within the discipline of geography, beginning with such modern founders of geography as Carl Ritter and continuing through to the present day within the German, French, British and American traditions. The beginnings of landscape study per se go back to Otto Schluter, who, at the turn of the century, proclaimed landscape as the research object of geography (Buttimer, 1983).

Although the term is sometimes used to discuss the morphology of the land in physical geography studies, "landscape" has most often associated with the study of the manifestations of human use of particular portions of the land. In American geography, Sauer (1963), Hartshorne (1939), and Meinig (1971, 1979) stand out as major figures by virtue of their contributions to the literature of landscape as an expression of culture. In the United States, landscape studies have been most often associated with the work of Carl Sauer and his disciples, although others have certainly made valuable contributions (for example, Meinig, 1979; Jackson, 1984; Zube and Zube, 1977).
A related but independent stream of landscape study has emerged from British geography, largely based on Marxist theory as adapted to a sociological framework by Giddens (1979), and claiming descent from Vidal de la Blache (Pred, 1984a). Relatively recent in origin, this school of landscape study has sought to redefine landscape as the cognitive construct of a specific social group, rather than a concrete reality having the same signification for all people who experience that landscape (Cosgrove, 1984; Daniels and Cosgrove, 1988). By assigning to human agency the power to define and redefine landscape continually, these geographers have changed the focus from one which views landscape as static and invariant to one which captures the continual change and redefinition of landscape as a conceptual entity that is socially defined.

Most recent geographical studies of social process, however, have not addressed interactions between the physical and social spheres. The interrelationships between social and physical processes in the construction of conceptual landscapes have been most strongly suggested in the hazard research literature (Burton, Kates and White, 1978).
Landscape Studies

Although the tradition of landscape studies in geography can be traced back to Schluter's 1906 declaration, recognition of landscape studies as such within American geography did not occur until the 1920s. Prior to that time, it was the study of physiography and man-land relations, especially as exemplified by the environmental determinism (see, for example, Semple, 1959) that dominated the American research agenda. The pivotal point occurred in 1925, when Carl Sauer, in "Morphology of Landscape", strongly refuted the tenets of environmental determinism, and advocated instead a research agenda for the study of the cultural landscape which stressed the study of "the works of man upon the area" (1963, p.326). Sauer, who was influenced by the historical focus of German landscape studies, created a school of cultural geography centered at the University of California, Berkeley that was quite distinctive from the work going on elsewhere in the country (Solot, 1986). The Sauer school stressed the connections among anthropology, history, and geography and produced a body of work that revolved around the historical study of the human role in creating cultural landscape.

In "Morphology of Landscape" (1963), Sauer set forth his concept of what the study of geography should concern: "We assert the place for a science that "finds its entire
field in the landscape on the basis of the significant reality of chorologic relation" (1963, p.318). Writing his treatise as a refutation of the assumptions and methods of environmental determinism, Sauer firmly defined the task of geography as being the discovery of the areal connection of phenomena, and stressing the primacy of the works of humans: "There is a strictly geographical way of thinking of culture; namely, as the impress of the works of man upon the area" (1963, p.326). He defined landscape as "an area made up of a distinct association of forms, both physical and cultural" (1963, p.321-322). A landscape, according to Sauer, was identified according to its "recognizable constitution, limits, and generic relation to other landscapes, which constitute a general system. Its structure and function are determined by integrant, dependent forms" (1963, p.321). However, although observation of individual scenes was necessary, the geographic landscape was a "generalization derived from observation of individual scenes" (1963, p.322).

Sauer's use of the concept of "morphology" rested on three postulates: first, "there is a structure to which certain components are necessary;" second, the similarity of form among different structures is recognizable through recognition of functional equivalence; third, structural elements may be placed in a developmental sequence from incipient to final stage (1963, p.326). Methodologically,
these postulates were to be reflected through an examination not of the origins, but of the functional significance of the forms.

Although Sauer considered "morphology" to be his primary focus in landscape studies, he was careful to stress that both time and space relationships were important to landscape study. He advocated starting with the pre-human landscape and working forward, ultimately arriving at a climax form of development.

Among the more influential of Sauer's disciples were Derwent Whittlesey, whose concept of sequent occupance (1929) is based on Sauer's ideas of landscape development through time, and John Leighly (1937), who believed that cultural manifestations must be viewed within the context of the times in which they were created.

Although landscape studies were not a prominent part of the agenda for geographical studies during the 1950s and 1960s (Cosgrove, 1985), the field was not dead. As time went on, however, the studies became increasingly descriptive, and often focused on such artifacts of human culture as housing types and barns (Ley, 1988).

In Britain, the work of H.C. Darby was particularly significant in keeping the study of landscapes alive between the 1930s and 1960s (Williams, 1989; Darby, 1962). Himself a historical geographer, Darby, like Sauer, insisted that time could not be excised from geographical
studies. His early work used a "successive cross sections" method for representing change through time (Johnston, 1987). In his later work, he acknowledged that cross sections did not reflect the reality that different elements change at different rates and at different times (Williams, 1989), but he never denied the importance of the historical factor in the study of landscapes.

The emphasis on the need for history in the study of landscapes became overshadowed, in the United States at least, by the strong influence on geographers of Hartshorne's *The Nature of Geography* (1939). He insisted that the subject matter of geography was the study of regions. The questions to be posed by geographers were to be matters relating to space—not history. In addition, his pronouncement that landscape studies carried to any extent inevitably became areas studies prepared the way for the long line of descriptive works that were written from the point of view of the present manifestation of elements on the face of the earth.

After a period of emphasis on quantitative techniques during the 1950s and 1960s, renewed vitality in landscape studies occurred during the 1970s. During this time, a reaction to the excesses of positivistic science led to a focus on humanistic and behavioristic conceptualizations of the role of human agency in landscape creation. In landscape studies this reactive movement was evidenced in
the works of D.W. Meinig (1979), Peirce Lewis (1979, 1985) and J.B. Jackson (1984), all of whom were interested in the connections between people and places, and what meanings lay behind landscape phenomena.

One of the manifestations of the humanist response to positivist science was an interest in the symbolism of landscape elements, which itself can be associated with a general trend in social sciences toward an interest in hermeneutics. In particular, the anthropological work of Clifford Geertz (1973) reflects the impatience with "mere" description (called "thin" description by Geertz) as opposed to analysis of phenomena as created and defined by particular social groups (called "thick" description by Geertz). The assumption that symbols are static and unchanging was replaced by a belief that the study of the processes involved in symbol creation and definition would enhance the explanatory power of cultural geography. In this sense, the cultural landscape came to be seen as one of the "most accessible repositories" for analysis of the "process of the transformation of nature into cultural products" (Rowntree and Conkey, 1980) and therefore a prime subject for geographers to study.

The stress on interpretation required a new methodology. Such "interpretive research requires an interpretive methodology, a set of operating procedures . . . which are simultaneously able to pick up the nuances
of landscapes and their creators, without overlooking the broader contexts which structure local life chances" (Ley, 1988, p.100). These requirements have been addressed recently in a reformulation of the landscape concept within human geography that is based on the idea of reading landscapes as texts (Duncan and Duncan, 1988). When treated as texts to be read, landscapes provide entree into the "historic swirl of culture, politics, economics and personality in a particular place at a particular time" (Ley 1988, p.100). Studies by Anderson (1987) of the political and social construction of Vancouver's Chinatown as a symbolic manifestation of the dominant British-American culture is a recent example of work being done in this area.

Viewed more broadly, much of the current landscape research is strongly grounded in the social theory of Giddens (1979), Abrams (1982), and Berger and Luckmann (1966). These scholars base their concepts on the works of Marx, Durkheim and Weber. As introduced into geography by Pred, the "time geography" of Hagerstrand has also been an important concept (Pred, 1984a). Empirical studies combining landscape study with the new trends in social theory (especially as formulated within Giddens's structuration theory) are best exemplified in the works of Pred (1984a, 1984b) and Cosgrove (1984, 1985; see also Daniels and Cosgrove, 1988). In these studies, the
interaction of people and institutions, within constraints posed by the social, political, economic exigencies, is studied within the context of particular times and places. In essence, works such as these have expanded the parameters of historical geography.

**Structuration Theory in Geography**

According to Giddens (1979), structuration theory is concerned with the dialectical interactions between people and social systems, with social structure being the mediating influence. Within this scenario, the system includes the institutions and regularized relations that are needed to create and maintain social entities, such as communities. People, or "agency" in Giddens's terms, constantly create, re-create and maintain their communities, and thereby the institutions and regularized relations that support those communities. In turn, people's actions and power are enabled or constrained by those institutions and relations. This constant creation, re-creation and maintenance of society occurs through the process of "structuration," whereby rules and resources (the components of structure that are themselves subject to creation and change) mediate the ways in which systems and people change and influence each other (Giddens, 1979; Moos and Dear, 1986).
Of particular importance to geographers is the inclusion of both time and space as indispensable elements in the structuration process. All activities and relationships exist within a temporal and spatial context, and these contexts in turn influence the way in which structuration proceeds. Also important, particularly in the application of the theory to landscape studies, are the ways in which the structural components of signification, domination, and legitimation (all of which fall under the general categories of rules and resources within structures) come into play in the production, interpretation and use of landscapes. Within structuration theory, signification refers to the production of meaning; domination refers to the use of power, and legitimation refers to the application of norms which give the social construct a moral dimension. The investment of meaning in landscapes, the construction and use of landscape elements, the appropriation of those elements and control over their meanings for the purposes of reinforcing social norms are all subjects for inquiry when studying landscapes as social constructs.

In terms of the geographical tradition of human-environment studies, one of the important elements of structuration theory is the concept that humans exist in contradictory relation to nature because they are at the same time in and of nature, and yet they are set off
against nature. Humans have a "second nature" that cannot be reduced to objects or events. The contradiction of humans being of and apart from nature "sustains the accommodations reached with [nature] and the modes of control to which nature is made subject" (Giddens, 1979, p.161). Current landscape studies, rather than stressing only the outsider's view which concentrated on the morphology of external forms, place significance on the ways people see their situation from the inside; therefore, it might be said that these studies involve people "in" nature as well as apart from nature.

The significance of ideology and class struggle, of cultural production and the production of symbolic meanings in historical change are of paramount interest (Cosgrove, 1984) in recent sociogeographic studies. Structuration theory informs these inquiries both through the use of time-space contextuality and through the examination of the dialectical relationships among all factors included in the study.

Structuration theory is, however, far from a perfect answer to the social scientist's dilemma of how to study the ever-changing, subjective/objective world created by human beings. The most strongly voiced criticism of structuration theory involves the lack of a means for resolving the problem of determination so that the equally unsatisfactory poles of determinism and voluntarism are
avoided (Moos and Dear, 1986). The solution to this dilemma, as developed by Moos and Dear (1986) is the balancing of agency, structure, and system in such a way that none of them is treated as deterministic over the others. In their study of the ghettoization of ex-psychiatric patients in Hamilton, Ontario, Canada, Dear and Moos (1986) demonstrate how, through analysis of institutions and analysis of strategic conduct, all three structuration elements can be balanced within the poles of determinism and voluntarism.

One of the most fully developed works that incorporates social theory and landscape studies is *Social Formation and Symbolic Landscape* (Cosgrove, 1984). In this study, Cosgrove examines how the idea of landscape changed as capitalism spread throughout Europe from the sixteenth century on. He connects the changing ways in which landscapes were conceptualized, and how they were realized in space, place and time with the values and political, social and economic goals of those who were responsible for the creation of those landscapes. Through the use of documentary sources, he demonstrates how the Venetians, Dutch and English, in different time periods and different contexts, created landscapes, in art and on the land, that reflected themselves and their view of the world. For example, the establishment of grand parks in Britain are seen to be a way of asserting a strong preference for the
positive values associated with country life against the negative values of urban life, even though it was in urban settings that the goals of capitalism were necessarily pursued.

The linking of studies of social process with studies of landscapes has resulted in a renewed interest in locales as theaters within which social production and reproduction occur. Although claims have been made—and criticized—that a new regional geography, based on locales, is emerging from the convergence of contextually-oriented social theory and geography (Jonas, 1988), the focus has necessarily changed from one that views such "regions" in a sort of vacuum to one that takes into account the larger forces that impinge on that locale. Because of his focus on the pays and genre de vie as unifying concepts for the study of small regions and landscapes, the pioneering work of Vidal de la Blache is cited as a primary influence on modern geographical studies that are based on realist or structurationist principles and focus on landscapes or micro-regions (Pred, 1984a; Jonas, 1988).

Although not cited as influential, the Vidalian concepts of possibilism and contingency (Lukermann, 1965) are certainly germane to any examination of the current usage of structuration theory in geographical studies. Possibilism, involving some degree of determinism among various probabilistic alternatives, is not far removed from
the "balancing" of agency, structure and system in a way that avoids deterministic and voluntaristic extremes. Furthermore, the idea that outcomes are dependent upon how various contingent factors combine with each other is certainly related to the structurationist idea of social outcomes being grounded in contexts of time, space, and existing resources, rules, institutions, and so on. In addition, through his synthesis of physical and human geography, Vidal de la Blache demonstrated how localness was determined through the "intimate dialectical relationship . . . between local natural conditions and local material cultures" (Jonas, 1988, p.102). His examinations, in essence, took on aspects of "thick" description (Jonas, 1988).

The convergence of social theory and landscape studies, as demonstrated above, contains threads that have run through geography for many years, but has also inserted a few new threads, namely the association of the ideas of Marx, Weber, Durkheim, Geertz and, through them, the ideas of Levi-Strauss, Saussure, Foucault, Heidegger and Cassirer (among others), into the study of phenomena on the face of the earth.
Social Theory, Landscape Study, and Geography in the Late 1980s

Two main themes seem to run through recent landscape studies that utilize structurationist theories. Both are a logical outgrowth of the social relevance and anti-positivist movements of the 1970s. First, there is a growing interest in humanist studies and in perception studies. In this view, humans are re-inserted into the landscape as intentional actors, and landscapes comprise the symbols, or "codes," that represent the meanings those actors have invested in their world. The geographer, as landscape analyst, must decipher these codes to discover the underlying meanings. Methodologies such as "landscape as text" analysis offer a means for studying landscapes as symbols and as transformations of ideologies, and for explaining how landscapes are incorporated into social process (Duncan and Duncan, 1988; Geertz, 1973).

The second theme involves physical geography. Geographers, for many years, have been aware of humans as potent transformers of the environment (Williams, 1989), as ecological parts of nature (Barrows, 1923), and as entities vulnerable to the impacts of hazards (see, for example, Burton, Kates and White, 1978). The strengthened interest among geographers in the ecological relationships
between people and nature may yet afford geography another chance to assert authority in one of its traditional, but sadly undervalued fields, human-environment relations (Turner, 1989).

As a "characteristic and honorable response to the perceived chaos of the modern world," any attempts to gain stability of meaning in landscapes are welcome additions to our store of knowledge (Daniels and Cosgrove, 1988, p.8). To the extent that these landscape studies provide insight into the dynamics of social process, they have the potential to increase our store of knowledge concerning ourselves. In this sense, "landscape remains part of our unexamined discourse" and "seems to embody the holism which modern humanists proclaim" (Cosgrove, 1985, p.57, p.45).

Landscape within this framework is defined as "a cultural image, a pictorial way of representing, structuring or symbolising surroundings" (Daniels and Cosgrove, 1988, p.1). Landscape is, therefore, a way of seeing as well as being a "single objective reality outside our sensations" (Hartshorne, 1939, p. 163) and which encompasses forms occurring on the surface of the earth.

In the sense that it is associated with a "groundswell of greater environmental consciousness," interest in landscape has also been seen as an outgrowth of people's concern about their ordinary visual surroundings as well as of their "increasing awareness that landscape is a
reflection, to some extent, of the society that produces it" (Williams, 1989, p.100). Reciprocally, landscape also shapes society. From another viewpoint, it may be that "as the agency of the state in allocating resources has increased in capitalist countries, so landscape has grown in significance" (Cosgrove, 1984, p.254).

The focus of this interest has shifted from the earlier emphasis on landscape as a "moral commentary on social relations with land and with nature" to a more coldly scientific emphasis on landscape as a subject for study in academic geography and public policy (Cosgrove, 1984, p.262). A moral dimension remains, however, especially in the United States where "wilderness as landscape" has assumed and retained strongly value-laden attributes both among certain members of the academic community and among the general public.

The sociogeographic study of landscape involves certain necessities and engenders certain problems. First, understanding of politics is essential, because "most power resides with small groups or elites who make choices affecting the history and future of particular landscapes" (Penning-Rowsell and Lowenthal, 1986, p.123). In studying power relationships, it is necessary to keep in mind that landscape values, by tending to focus on the past, also tend to disregard the potential for new landscape innovations. New landscapes are distrusted, perhaps
because the vernacular is being lost in exchange for a "political landscape with its implications of distance and coercion which we distrust and dislike (Penning-Rowsell and Lowenthal, 1986, p.116).

Second, the introduction of language to describe landscape causes problems because it is difficult to verbalize what is seen. By verbalizing, we may actually "ossify" images which, in reality, change over time (Penning-Rowsell and Lowenthal, 1986). In addition, the problem of reconciling the sequential aspect of words with the instantaneous apprehension of a visual scene makes the study of landscapes difficult, particularly since the juxtaposition of events in space is even more difficult to convey than the juxtaposition of events in time (Darby, 1962). The resolution of these problems, of course, lies in carefully designing research projects, but equally importantly, it lies in the careful writing of research results so as to convey time and space factors as completely and accurately as possible. It is at this juncture in landscape studies that the "art" of geography meets the "science" of geography (Darby, 1962; Lewis, 1985).

Perhaps most telling, however, of the current focus on sociogeographical studies of landscape is the realization that "if landscape is conceptualized as a way of seeing, rather than a thing, then the questions
[geographers ask] will have to be radically rephrased" (Penning-Rowsell and Lowenthal, 1986, p.45). The convergence of social theories, such as structuration theory, with landscape studies is a manifestation of attempts to rephrase the particular questions that geographers ask.
CHAPTER 3

METHODOLOGY

This study employs textual analysis of the landscape as a means of providing a sociogeographical explanation of the interactions among institutions, individuals, social framework and the riverine environment of the Santa Cruz River. Such analysis involves the collection and analysis of a wide variety of information about the landscape both as it appears during the timespan covered by the study and as that landscape has emerged and evolved over time.

In landscape-as-text analysis, the landscape elements themselves constitute the text which is to be read. The individuals, groups, or institutions responsible for the creation of the elements which comprise the landscape are the authors. The readers of the landscape are those individuals, groups or institutions who interact with, or invest meaning in that landscape. The intertextual significance of the landscape comprises the meanings invested in that landscape by its readers (Duncan and Duncan, 1988).

The goal of a landscape-as-text study is to identify and explain the ways in which institutions, agents and social framework interact in time and space. This is accomplished by examining the production and intertextual signification of the elements which comprise the landscape.
Such an intertextual analysis involves discovering the meanings invested in the landscape and identifying the agents responsible for producing those meanings. The inquiry includes a study of the institutional contexts from which the landscape and its signification arise, the actions and intentions of the agents who, as individuals or groups, give meaning to the landscape, and the social framework within which the agents and institutions interact, resulting in the production of the landscape and its signification.

For this study, a physical resource, the Santa Cruz River, has been included in the analysis. By including the river as an additional contextual factor, it is possible to examine the role which natural events and physical conditions play in social process.

Selection of Study Reach

Landscape-as-text analysis requires a thorough understanding of both the spatial and temporal dimensions of the landscape being studied. This study of the Santa Cruz River focuses on the segment of the river extending from the northern border of the San Xavier Indian Reservation on the south to the southern edge of the town of Marana on the north (see Figure III-1).
Figure III-1: Study Reach

(based on Holub and Burkin, 1987)
In width, the study has been limited to the floodplain of the Santa Cruz River between these two longitudinal end points. The reason for limiting the study to the floodplain was to enable the study to focus most sharply on the interactions between humans and their riverine environment.

The floodplain used for this study varies, according to the period under study. For the pre-entrenchment landscape, the floodplain was defined as including all agricultural areas, and the site of Carrillo's Gardens at the corner of present Simpson and Main Streets. For the transitional and post-entrenchment phases, the area defined as the erosion boundary on the Santa Cruz River Management Plan Technical Report (Simons, Li and Associates, 1986b) was chosen. The reason for choosing two separate boundaries was to ensure that the maximum amount of land vulnerable to significant flooding was included in the study. Erosion zone boundaries were chosen rather than the 100-year floodplain boundary, because the former were considered to be a more accurate rendering of the land which would actually be damaged by flood flows during a major flood event. The erosion zone more effectively takes into account potential damages that could occur from bank erosion (a more common occurrence during flood events in the Tucson area).

The San Xavier to Marana segment of the river was
chosen for study because of its history of continuous occupation, extending back some 5500 years (Betancourt, 1978b). A wealth of historical, scientific, economic, social and anecdotal documentation exists concerning this stretch of the river. Furthermore, being one of the main settlement areas and one of the primary travel corridors in the Southwest, this stretch of river has experienced significant impacts from the dominant social and economic forces of each of the major groups which have occupied the area: Indians, Spaniards, Mexicans, and Anglos. Two other groups, the Manso Apache Indians and Chinese, though never dominant forces in the area, also played roles in the occupation of the study area.

The dynamic nature of social and natural processes renders definition of study boundaries very problematical, both in terms of time and space. The floodplain of the Santa Cruz River has changed significantly since the late 1800s, due to the entrenchment of the stream, to the disappearance of surface flow in the river, and to changing institutional definitions of what constitutes a "floodplain" (Reich, 1976, 1984a, 1984b, 1985a; 1985b; Fonseca, 1983; Betancourt, 1988). For purposes of this study, the floodplain encompasses that area of ground that was subject to flooding during the time the landscape element under consideration played a significant role within the sociogeographical structure of the community.
In several cases, landscape elements have been included which are not within the defined 100-year floodplain, but which adjoin the floodplain boundary. These elements were included because of their close interrelationships with current social processes and the floodplain environment.

The southern boundary of the study area, the San Xavier Reservation, is a political boundary which has remained in place since the end of the last century. This boundary has proven to be relatively impermeable to the influences of the urbanization of Tucson.

The northern extent of the study area, the city limits of the Town of Marana, has been changing rapidly, even as this study has been conducted. For this reason, it has been necessary to select a somewhat arbitrary northern boundary to the study area. Cortaro Road was selected for this purpose because it encompasses a considerable portion of the agricultural land use which came to be a significant factor in the area after the introduction of deep draft pumps. This boundary also allows for incorporation of a considerable portion of the agricultural land which stands to be urbanized within the not-too-distant future, and which reflects the current struggle between the City of Tucson and the Town of Marana for control over diminishing available tracts of developable land within the greater Tucson Basin.
Data Collection and Analysis

To assemble data for the study, it was necessary to draw upon a wide variety of sources, including historical narratives, photographs, aerial photographs, orthophotoquads, thematic, planimetric and topographic maps, scholarly studies, documents produced by/for governmental agencies, newspaper and magazine accounts, personal interviews, and field reconnaissance of the study area. These sources were analyzed to discover the specific landscape elements which existed within the study reach during the timespan studied, the individuals or groups responsible for the appearance of those elements, how the elements interacted with the natural riverine environment, and what role the elements played in the functioning of the community.

From the list of landscape elements compiled from this preliminary research, a group of elements was selected for each of the following time periods: pre-1890, before the river entrenched and deep draft pumps came into widespread use; the transitional phase from 1890 to 1920 when the river was undergoing transformation from a shallow stream which was the major water source for the community to an entrenched, dry arroyo; invisible phase from 1920 to 1974 when deep-draft pumps and corporate and governmental involvement in water development enabled the community to
grow far beyond the bounds dictated by reliance on surface flow; and 1974 to 1989, when significant activity was begun to clean up the river, control flood ravages, and re-incorporate the river and its floodplain into the life of the community.

Criteria for selection of landscape elements included: direct interrelationship between the community and the riverine environment (measured in terms of how that relationship was characterized in the sources utilized); existence within the Santa Cruz River floodplain; potential association with events, trends, or institutional influences at the local, state, or federal level. Each of the selected elements was studied in terms of the timespan of its existence; who created the element; what factors led to its creation and disappearance (if applicable); the nature and timing of its importance to the community or to a subgroup of the community; and to determine what the element reveals about the interactions between individuals, institutions, natural forces and the social framework within which it had particular significance to the community or to a subgroup of the community.

Historical Narratives

Historical narratives were used to compile a list of past landscape elements within the study reach. Among the sources used were personal accounts, local histories,
newspaper accounts and oral histories. These sources provided a great deal of information about when certain features appeared on the landscape, who authored them, the context within which they were generated, and what the elements signified in terms of the interrelationship among individuals, institutions, the physical environment, and the social framework of the time.

Photographs

Photographs dating from 1880 to 1955 were examined. These photographs provided insight into what various landscape elements, now vanished, actually looked like; what elements were considered by the photographers to be interesting subject matter for photographs; and how the elements were situated within the physical environment.

Aerial Photographs, Orthophotoquads, Topographic Maps, and Planimetric Maps

Aerial photographs taken between December 1979 and May 1980 were compared with 1972 orthophotoquads and 1975 topographic maps of the same area to identify landscape elements and land uses within the study reach. Aerial photographs taken during September, 1985 were examined for land use patterns and were compared with the accompanying 1985 planimetric maps to identify salient landscape elements and their placement relative to the regulatory
floodplain boundaries effective as of that date.

The data gathered from the 1972, 1975, and 1979-80 maps and photos were compared with the data gathered from the 1985 photos and maps to determine whether any major changes had occurred in the existence of landscape elements or in land uses in the wake of the 1983 flood event.

Other Historical Maps

The following maps were examined to determine the extent and nature of land uses during the timespan covered by this study: Official Map of Pima County (Roskruge, 1893); City of Tucson Map (1973, scale 1"=2400'); City of Tucson Map (1980, scale 1"=2400'); Map of Pima County (1932, scale 1"=6 miles); Official Relief Map of Pima County (1932, scale 1:21,000); Land Status Map of Pima County and Santa Cruz County (1959, scale 1:250,000).

Comparisons were made between the types and distributions of land uses and landscape elements evidenced on the various maps in order to determine the types and extent of changes which have occurred during the designated timespan.

Scholarly Studies, Governmental Agency Documents, Newspapers and Magazines

Scholarly studies, documents published by or for governmental agencies, and articles from local newspapers
and magazines were used to derive information regarding the existence, significance, and time period of various landscape elements, to identify persons, groups or agencies associated with those elements, and to discover the contexts within which creation and signification of those elements was most active.

Personal Interviews

Individual interviews were conducted with persons who were identified during archival research as having played some role in the creation, identification or signification of one or more of the selected landscape elements. The interviews were minimally structured, thus allowing the interviewees maximum latitude for expressing their involvement in, or insight into the creation, signification, or interrelationships associated with the landscape elements under discussion.

Field Reconnaissance

The author hiked most of the length of the study area, excluding the portion from Camino del Cerro to Cortaro Road. Because of obstacles created by surface flow, dense vegetation, and encroaching land uses, this portion was studied from various vantage points along the roads that parallel or cross the river in that area. Photographs were taken and notes were made of the landscape features along
the entire study reach. These photographs and notes were compared with the descriptions of the area derived from written sources to determine the extent to which the features mentioned in the written sources were discernible on the current physical landscape.

Newspaper Analysis

For this study, an investigation of newspaper articles was performed to determine the extent to which community awareness of the river during the "invisible" period of 1920 to 1974 differed from awareness during the "reemergence" period 1974 to 1989. Articles dealing with the river (or with landscape items identified in this study) which appeared in the major local newspaper, the Arizona Daily Star, during the time periods 1954 through 1959 and 1974 through 1979 were measured for number of column inches devoted to the story. A comparison of the total number of column inches devoted to these topics was then made to test the hypothesis that the landscape was invisible from 1920 to 1974, then re-emerged into visibility after 1974. An increase of fifty percent or more in the number of inches devoted to the river and related features for the period 1974 through 1979 was deemed to be indicative of significantly increased visibility.
Summary

This study covers a portion of the floodplain of the Santa Cruz River extending from Los Reales Road northward to Cortaro Road. The study employs textual analysis techniques to derive information from a wide variety of data sources, including field survey, photographs, aerial photos, archival materials, scholarly studies, newspaper articles, personal interviews and maps.

Such textual analysis involved, first, an analysis of the data to discover the institutions, agents, events, landscape elements, rules, and resources which played a role in the evolution of the riverine landscape. The analysis also included a study of how these factors occurred in time and space. Further, analysis included interpretation of the data to explain how the physical environment, institutions, agents, and rules and resources interacted with each other to produce the visible landscape, and how the landscape, in turn, influenced those factors. Finally, textual analysis included an examination of how signification, domination and legitimation were employed to accomplish social reproduction.

The information from the various sources was categorized into four time periods: before 1890; from 1890 to 1920; 1920 to 1974, and 1974 to 1989. Each of these time periods was chosen based on the nature of the river
and the landscape elements apparent on the floodplain during that time span. The date of 1890 was chosen as a breaking point because that was the year during which entrenchment, which greatly changed the nature of the fluvial regime and the community's interaction with the river, occurred. The 1890 to 1920 period represents a time of transition in the interaction between the community and the river. During these years, an effort to maintain existing institutions based on utilization of surface flow was supplemented, and eventually supplanted, by a system of resource utilization based on exploitation of groundwater. The year 1920 was selected as the ending date for this era because that was the date that Los Reales, a Mexican-American community located along the river and engaged in irrigated agriculture drawing on surface flows, was abandoned for lack of water.

The 1920 to 1974 period is characterized primarily by a lack of activities which could be interpreted as reflecting community awareness of the river and its floodplain as a riverine environment. The ending date of 1974 was chosen for this era because that was the year during which federal floodplain regulations were initiated, thus stimulating renewed interest in the Santa Cruz River.

The post-1974 period, as a result of a number of factors, including federal and state regulations, political and economic events, changing social patterns, and growing
awareness and concern about environmental issues has seen a re-emergence of the river as an interacting factor in the local social system.

Landscape elements were analyzed in terms of the social, political, economic and physical conditions of the time period within which they were categorized. Content analysis was then employed to discover how contextual and physical elements interacted in space and time. The goal of the analysis was to determine the relative visibility of the landscape to local residents over the course of the time periods studied, with particular emphasis placed on conditions and events which have occurred since 1974.
CHAPTER 4
THE LANDSCAPE AND ITS CONTEXT: PRE-1890

Evidence suggests that humans have occupied southern Arizona for some 12,000 years; however, a fully sedentary group of agriculturalists, the Hohokam, did not settle in the Tucson area until the late Pioneer period (A.D. 300 to 500) (Betancourt, 1978a, 1978b). The Hohokam, who originally migrated into Arizona from Mexico in approximately 300 B.C., occupied the floodplain of the Santa Cruz River in the vicinity of Tucson from approximately 300 or 500 A.D. until about 1400 A.D. Although nothing is known about the reason for their disappearance, the extensive irrigation systems they developed were still being used by the Piman tribes at the time of the arrival of the first Spanish missionaries in the late 1600s.

When Father Kino arrived in the 1690s, Native American agriculturists working along the floodplain Santa Cruz near used check dams, low dikes, and short canals for irrigation. Called "ak chin" agriculture, this method of floodplain irrigation allowed the cultivation summer crops of maize, beans and squash (Dobyns, 1981). Using brush dams to divert water into small ditches, they were cultivating approximately 1500 acres at San Xavier at that time. Other methods employed at the time included terraces
and borders designed to slow the water flow and allow it to soak down to plant roots, and brush diversion dams and rock check dams constructed at the mouths of arroyos to capture and channel water from summer thunderstorms. Small springs and seeps were also exploited for irrigation and drinking water and shallow wells were sometimes dug in the alluvium.

Due to the more regular flow of water, centers of irrigated agriculture supporting large populations existed at three locations in the vicinity of Tucson: near San Xavier, near the base of Sentinel Peak, and at Nine Mile Water Hole near the confluence of the Canada del Oro and the Santa Cruz River (Kupel, 1986).

Although extensive agriculture was carried on during the summer, the Indians retired to water sources in the mountains and engaged in hunting and gathering for subsistence during the winter months. Thus, the pre-Spanish landscape along the Santa Cruz was one of semi-sedentary settlement which was heavily populated during the summer growing season and abandoned in the winter.

The arrival of the Jesuit missionaries in 1700, with their Old World seeds (particularly wheat) and livestock, changed forever the practice of agriculture along the Santa Cruz. Plans for extensive agriculture were actualized, beginning in the early part of the eighteenth century, through the construction of a series of irrigation works
which diverted waters from the river and from springs which flowed along the river's margins to fields laid out on the floodplain.

Based on technology introduced to Spain during the Moorish occupation, the Jesuit, and later, Franciscan, missionaries, followed by Spanish soldiers and settlers associated with the Tucson Presidio, developed an extensive network of acequias (irrigation ditches) which allowed them to irrigate large plots of wheat as well as other crops.

The development of structures to control the flow of water gave the Spaniards a strong means of exerting control and influence over the Indians in the area. They did not hesitate to exercise this control (Meyer, 1984).

Located across the river from the Indian village at the foot of Sentinel Peak, the site of the San Agustin del Tucson presidio was selected in 1775 by Hugo O'Conor to take advantage of the plentiful water, pasture, wood, available along the river (Sheridan, 1986). The garrison, positioned on the terrace above the east bank of the river, was also in a strategic position to effect closure of the troublesome Apache frontier (McCarty, 1976). With the removal of the presidio troops from Tubac to the new garrison at Tucson, agricultural activity on the floodplain increased. Parcels of floodplain land were converted to agricultural fields from Sentinel Peak southward toward the San Xavier Mission. A well was dug inside the presidio
walls for drinking water, but the soldiers had to haul water from the Santa Cruz to supplement supplies. The increase in population resulting from the arrival of the Spaniards resulted in social tensions with the Indians over a water shortage. Although the disagreement was settled by allotting three-fourths of the water to the Indians and one-fourth to the presidio, the Indians in the long run ended up on the short end of the distribution.

The landscape became even more of an oasis as vegetation sprouted up along the acequias. Cottonwoods and willows lined the acequias, and the natural course of the river became somewhat obscured by the maze of artificial waterworks. The new landscape included species foreign to the Indians who had for centuries raised modest crops of maize, squash, beans and melons. Wheat and alfalfa now grew along the river. Domestic livestock and wagons cut paths along the water's edge. As late as 1804, however, the population of soldiers, settlers and Indians lived in an area of less than two square miles around the presidio, due to the depredations of the Apaches who regularly swooped down the Catalina and Rincon mountains to raid the settlement.

Mexican independence resulted in few changes on the northern frontier of Pimeria Alta. The missions were secularized in 1827, resulting in a plundering of the missions and a decrease in agricultural tillage. The
Indians saw their status deteriorate as their allotment of water was cut again, in 1828, from three-fourths to one-half (Kupel, 1986). For the Hispanic settlers in the community clustered around the Tucson garrison, however, the subsistence-level economy continued unchanged, with few goods arriving from or departing to the outside world. Life on the floodplain continued to be geared to the vagaries of the river, which even then was unpredictable, and on the intensity of the depredations inflicted by the Apaches.

For the entire period of the Spanish and later Mexican rule, the Tucson area was a hostile and dangerous frontier. Existence on the fringes of the Spanish/Mexican domain was circumscribed by harsh desert conditions, Indian raids, and long and difficult passages to points beyond. Trade routes largely followed the Santa Cruz River, passing north and south between Mexico and the northern settlements. Subsistence agriculture and locally-consumed manufactures, such as saddles, soap, and candles, characterized the economy. Politically, the settlement was a garrison, ruled by a commander appointed by the Spanish monarch (or later, by whomever was ruling Mexico at the time).

Although Anglo fur trappers entered the area as early as the 1820s, things began to change significantly only after the discovery of gold in California in 1849. The gold rush, which drew hordes of Anglos across the desert in
search of instant wealth, also drew men who saw fortunes to be made in the adobe village of Tucson. The Gadsden Purchase of 1853, negotiated to secure an all weather route to California, severed the area from Mexico and attached it to the United States.

When American troops finally took over Tucson from the Mexican soldiers in 1856, the fields on the Santa Cruz floodplain were producing enough crops for the settlers and soldiers, but were not producing any surpluses (Kupel, 1986). Mexicans, Anglos, and Indians were all farming lands west of the city during this time period, but the majority of the agriculturalists were Mexican families who owned most of the fields and used water drawn from three acequias on the floodplain of the Santa Cruz River (Kupel, 1986).

With the arrival of the Anglos, trade and migration routes became predominantly east-west in orientation. Still dangerous until the last two decades of the nineteenth century, these routes nevertheless carried increasing quantities of supplies and equipment, including the first mechanical water pumps.

Although agriculture and cattle herding remained the primary economic pursuits, commercial establishments began to proliferate. American merchants established themselves in Tucson as early as the 1850s, when Tucson served mainly as a way station for travelers bound for California.
In 1856 the Rowlett brothers from Virginia dammed the Santa Cruz, creating what was later to be known as Silver Lake, and built a water-powered flour mill. Solomon Warner, later to build one of the few structures that would remain on the Santa Cruz River, arrived in town in 1856 and established the town's first mercantile store with partner Mark Aldrich (Betancourt, 1988). A stagecoach route was established in 1857. In 1858, Sam Hughes, another of the individuals important to the subsequent evolution of the Santa Cruz River, arrived. Although his original means of livelihood was a butchering business, his efforts in later years to extend agriculture into floodplain lands not regularly watered by the river were to contribute to the profound hydrologic changes that began to occur only three decades after his arrival.

The Civil War of 1861 to 1865 brought to a temporary halt plans for connecting the west coast with the rest of the United States, and curtailed growth in the area.

Although the town's activity decreased considerably during the Civil War, it bounced back quickly once the war was over. In 1866, the year after the end of the Civil War, Camp Lowell was built on the eastern border of Tucson. Established to provide a military force capable of subduing the Apaches once and for all, Camp Lowell added yet another market for the crops grown along the Santa Cruz and for the flour ground at mills such as the one at Silver Lake (by
this time known as the Pioneer Mill and owned by Mssrs. Lee and Scott) and the one built by Solomon Warner at the foot of Sentinel Peak in 1875.

Because it was still essentially isolated from the rest of the United States, Tucson even managed to post economic gains in ranching, mining, military and agriculture during the Panic of 1873 and the depression that persisted until 1877 (Kupel, 1986).

The city became the capital of Arizona Territory from 1867 to 1877, and remained a center of political power for the next forty years (Bufkin, 1981). The town applied for a patent for 1440 acres straddling the Santa Cruz River in 1871, but it reduced its application to 1280 acres in 1872 when the first land surveys in the area, carried out by S.W. Foreman in 1872, placed the floodplain of the Santa Cruz River outside boundaries to be approved for the town patent (Bufkin, 1981). In 1876 Theodore F. White conducted another survey. This survey, which included the floodplain, formed the basis for issuing deeds confirming land ownership in the area, a problem carried over from the days when Mexico controlled the area and land title was less formally established.

In the following year, 1877, the Territorial Legislature passed an act incorporating Tucson as a city. The Southern Pacific railroad arrived in 1880, stimulating urban growth as well as mining and agricultural activities.
For the first time, it was possible to move large quantities of goods into and out of Tucson with relative ease and at far less expense than using wagon trains.

The railroad had social effects as well. The path taken by the railroad through Tucson effectively divided the city on a southeast-northwest axis, which resulted in a marked distribution pattern of Hispanics on the south and west sides of the city, and Anglos on the north and east sides. These patterns persist to the present day, with the result that large and long-established Hispanic communities continue to exist on or within close proximity to the Santa Cruz floodplain (Sheridan, 1986).

The availability of land, particularly east of the city, and the enactment of the Desert Land Act of 1877, meant that large portions of public lands surrounding the city could easily be acquired and turned into versions of the national dream of an agricultural utopia (Kupel, 1986). The foundations for the eastward movement of settlement within the Tucson area were thus laid at this time.

By 1880 the railroad had linked Tucson with the outside world, and the Apaches had retreated to mountain strongholds far east of the village. Once more commodious travel than a stagecoach trip across a dry and hostile landscape was available, the Anglo population of the village began to increase substantially. American capitalists, as well as Hispanics who succeeded in
accumulating wealth during the United States' great push west, acquired much of the bottomland along the river. Some of this land, south of Saint Mary's Road, was leased to Chinese railroad workers who took up cultivation of water-intensive vegetable gardens. At the same time, increased demand for agricultural development north of Saint Mary's Road culminated in a legal battle played out in the county court in 1885 between upstream and downstream farmers.

Because surface flow usually disappeared just north of Sentinel Peak, the lands north of Saint Mary's Road had traditionally been cultivated only during times when the Santa Cruz had a flow regime that was higher than usual. During the rest of the time, these fields lay fallow. By the 1880s, capitalists such as Sam Hughes saw money to be made in the full development of these fields, assuming they could be apportioned a part of the water traditionally used by upstream farmers. By 1881, most of the available water in the Santa Cruz River had been diverted to manmade irrigation works. Eight streams of water, including five ditches seven feet wide and three narrower ditches, ran through the floodplain opposite Tucson (Arizona Mining Index, February 13, 1886, quoted in Betancourt, 1988). A drought beginning in 1885 alerted the city to the precariousness of its water supply. By 1886, irrigation water was being sold for $1.25 per acre (Kupel, 1986).
was within this context that tensions over access to water intensified, culminating in a civil lawsuit. The lawsuit, *W.A. Dalton et. al. v. Leopoldo Carrillo, et. al.*, was brought to county district court in 1884; the trial was held in April, 1885.

The scenario leading to the lawsuit was as follows: Chinese farmers had leased land from Sam Hughes, W.C. Davis, Solomon Warner, and Leopoldo Carrillo to cultivate vegetables. Because the vegetables they planted required considerably more water than the grain crops traditionally planted on the floodplain, water diversions increased, leaving less water for those who farmed downstream of Saint Mary's Road. Traditionally, water was apportioned to the fields by a water boss (called a zanjero) who determined allocations based on prior right and on need. The water shortage of 1885 prompted upstream users, who controlled the diversion points, to begin requiring everyone who used water to buy tickets to water their crops. This infuriated the downstream users because they had already paid an assessment to ensure that everyone shared the shortages proportionately (Kupel, 1986). They sued the upstream users, but lost the case in court. In effect, the judge ruled that the upstream users, by virtue of prior right, would receive their full allotments. Likewise, the Chinese farmers would receive the water they needed since they were farming lands to which these prior rights were appurtenant.
Downstream users were to receive water only after the upstream needs had been met (Betancourt, 1988). The decision of the court in favor of the upstream farmers affirmed the doctrine of prior appropriation, which to this day determines how surface water is allocated in Arizona. Although a victory for the institutionalized system adopted from the Spaniards, it turned out to be a Pyrrhic victory, for Sam Hughes within a very few years had fixed his sights on a new scheme designed to tap underflow for the downstream fields he wanted to farm.

Unable to acquire financing for the grandiose irrigation scheme he envisioned, he decided in 1889 to initiate a headcut in the river (at the site currently occupied by the Arizona School for the Deaf and Blind at Speedway and the river). He expected the river to finish the canal for him during the next rainy season. As events transpired, the rains came so intensely in 1890 that torrential flooding not only cut his canal, but over the course of the following years entrenched the river throughout the stretch running through Tucson and beyond.

The erosion of the river into a deepening trench had profound effects on the landscape which had been created over the years by those who had come to call Tucson home. Not only were Silver Lake and Warner's Lake destroyed, but over time the subsequent drop in the water table denuded the riparian landscape of the last vestiges of cottonwoods,
willows, and mesquites which had provided an oasis in the midst of the desert.

The actual cause of arroyo formation in the American Southwest has been the subject of considerable interest for many years, with explanations taking into account an increasing number of causes as the sciences of hydrology and hydrogeology have developed in sophistication. Changes in vegetation coverage (including overgrazing), deterioration of Indian check dams and terraces, cutting of wagon roads, livestock trampling, climatic changes, and the earthquake of 1887 are among the factors considered to have contributed to arroyo formation (Cooke and Reeves, 1976; Dobyns, 1981; Graf, 1983; Betancourt, 1988). Certainly Sam Hughes' ditch contributed to the formation of the arroyo through Tucson.

A few years of intensive searching for water occurred during the drought years that followed the 1890 and 1891 floods. This transition period marked the last throes of the old order based on exploitation of easily accessible surface water supplies, thus precluding downstream farmers from fully exploiting their fields.

Throughout the pre-entrenchment period, the city remained within the two-square-mile area which the early town fathers had believed would be sufficient to accommodate all future growth (Bufkin, 1981). The floodplain of the Santa Cruz remained primarily an area of
agriculture, while the city took on more and more of the characteristics of an eastern American city. Victorian houses, built of red brick rather than adobe, grass lawns and tree-lined streets sprouted with the arrival of trainloads of new settlers from more humid areas.

Fire insurance requirements, which prompted the city to award its first water contract in 1875, provided for delivery of water from artesian wells. Although this effort, and a second effort undertaken in 1879 failed to produce envisioned supplies, future events could be foreseen.

The Tucson Water Company was incorporated in 1882 by Sylvester Watts and James W. Parker. Backed by capital from the midwest, they purchased 1,000 acres of land six miles south of Tucson and constructed a pipeline to the corner of Main and McCormick Streets in downtown Tucson. There the pipeline connected with the water mains that distributed water within the city. The availability of piped water soon led to irrigation of lawns and trees, and watering for dust control. In 1889 the Tucson Water Company built its first steam-driven pumping plant which drew water from the underlying aquifer at 18th Street and Osborne Avenue (Kupel, 1986).

The combination of increased demand and the popular belief of the time, that rain followed the plow, proved to be particularly disastrous to the hydrologic regime of the
Santa Cruz River. The introduction of steam technology in the 1870s to pump water and grind flour contributed to the already heavy depauperation of woodlands along the river. This removal of stabilizing vegetation only made matters worse by exposing the loose alluvium to heavy erosion and generating increased runoff into the river, which in turn translated into increased erosive power.

Eastern capitalists, traveling on the newly built railroad, brought land speculation to Tucson. Having obtained large parcels of land in the area, these capitalists proceeded to entice settlers westward by creating carefully designed campaigns which advertised the west as a garden just waiting to be cultivated. Such activities dovetailed neatly with the Republican platform of the era, which espoused a national moral imperative to settle the west. Whereas the propaganda of the time depicted yeoman farmers conquering the west, however, the actuality was that the benefits of irrigated agriculture accrued to businessmen and land speculators (Kupel, 1986). Unfortunately, not all of the speculation and land acquisition was carried out legally. Tucson was singled out in the 1885 General Land Office Annual Report as an example of an area where land and water were being monopolized by stockmen who acquired title through their employees (Kupel, 1986).
The Pre-1890 Landscape

Of the landscape elements extant during the pre-entrenchment phase of the Santa Cruz River, the agricultural fields are the most significant in terms of importance to the livelihood of the area's inhabitants. Father Kino himself waxed eloquent regarding the merits of the Tucson area when he characterized the fields and irrigation system as being so extensive as to support another city like Mexico City. (Bolton, 1919, cited in Betancourt 1988). Although such exaggeration may have been used to encourage support for establishment of a mission in the area (Betancourt, 1988), enough irrigable land was available in the area between Sentinel Peak and the cienegas (marshes) near present San Xavier Mission to support the establishment of a year-round, sedentary farming community.

The establishment of the presidio, although built on high ground to the east of the Santa Cruz floodplain, had an effect on the floodplain landscape by introducing into it Spanish settlers who constructed and lived year-round in adobe haciendas, and extended the system of acequias and cultivated fields begun under the missionaries.

The first permanent Spanish structure to appear on the Tucson-area floodplain, a mission variously known as San Cosme, San Agustin, San Jose, and the Convento, was
built by Father Garces at the foot of Sentinel Peak, a site whose occupation goes back some 3,000 years (Arizona Daily Star, March 12, 1989). Begun in 1771 at the behest of the local Indians and in recognition of the location's strategic importance as a link in the route to Alta California, the mission was created as a visita (substation) of the San Xavier del Bac Mission (Williams, 1986). The compound eventually grew to include a large chapel, a two-story convento, a granary, and a walled garden irrigated with water transported via acequia from the Santa Cruz River.

The mission was hardly completed, however, before structural deterioration set in. Decay began as early as 1810 in the chapel and was seriously underway throughout the compound by 1843 (Hard and Doelle, 1978). The chapel had collapsed, and the second story of the mission house was in a dilapidated state. The two orchards were derelict, and the communal fields attached to the mission were being cultivated by only six Indians and "by a neighbor from the presidio who has not paid any rent since 1840" (Quiroga, 1843, quoted in Hard and Doelle, 1978, p.12).

Until the 1880's, agriculture, the mission ruins and the flour mills at Silver Lake and at the foot of Sentinel Peak comprised the major "authored" elements on the landscape. With population growth and increased wealth
beginning in the 1870s, a market for recreational and aesthetic amenities developed.

Among the more popular spots which arose to accommodate leisure pursuits was Carrillo's Gardens (later renamed Elysian Grove), located at the intersection of Simpson and Main Streets where Carrillo school now stands.

Leopoldo Carrillo, known for the fine grapes and peaches he grew, converted 8 acres of "waste land" (Arizona Citizen, 1879) near El Ojito spring on the south side of town into an oasis for the enjoyment of the local townspeople. The gardens included an orchard, extensive rose gardens, and man-made lakes, all watered via sluices tapped into several springs which debouched along the edge of the river terrace. Also included in the gardens were a "luxurious saloon, private rooms, hot baths, and a dance pavilion" (Sheridan, 1986). It was here (as well as at Levin's Gardens nearby) that Tucson's prominent citizens held their formal parties and the rest of the townspeople picnicked and boated on weekends. It was also the site for some years of the wild Fiesta de San Agustin, celebrating the feast day of the patron saint of Tucson.

Another notable place of recreation for Tucsonans in the latter years of the nineteenth century was Silver Lake. Called Lee's Pond in years past, the reservoir had become known as Silver Lake by 1881. A masonry dam across the Santa Cruz held back the waters, creating a lake of
something less than twenty acres. The recreational facilities, which were constructed in 1881 and renovated in 1884, included bath houses, hotel, pavilion, a picnic grove, and a "stout rope" for those learning how to swim (Barter, 1881, cited in Betancourt, 1988; Kupel, 1986). As late as 1890, the Arizona Daily Star described the lake:

The bathing pond of the hotel is full of clean, fresh water. This pond is 14 feet deep and a springboard has been erected to accommodate bathers." (Arizona Daily Star, August 8, 1890)

Solomon Warner was another key figure in the development of water-based recreation on the Santa Cruz. Although at some point in the 1870s he had created a small pond downstream from Silver Lake, his brief foray into bigger operations began in 1883 when he bought up land along the west branch of the Santa Cruz River and built a dam to hold back the spring-fed cienega which existed at the foot of Sentinel Peak. An early example of multiple use, Warner stocked the lake with carp to be marketed to townspeople. A reporter for the Arizona Citizen gave rave reviews to Warner's work:

The waters of the many springs of the different cienegas on the Warner land have been held back by the dam and have risen till they have covered some 20 acres of land, creating a sheet of water that is beautiful to look upon. Already the wild fawn have made it their resort, and an organization of hunters have obtained the exclusive right to shoot upon its waters. A flat-bottomed boat sails over its surface. The different kinds of ducks killed there are the gray
and spoonbill, the green and red winged teal, mallard, canvass back, widgeon, spring tail, the butter and a new kind never seen before called the fish duck. When the dam is completed and the waters have occupied all their space, about 50 acres will be covered. (Arizona Citizen, November 18, 1883)

At this time, Warner began to draw up plans for bath houses to compete with the Silver Lake Resort. Financial difficulties, and a legal battle over water rights in 1884, overtook Warner before he could implement his plans for a resort. In 1886 he sold his property to Mrs. T.L. Shultz, who, due to a flood that summer, was forced to sell it to George Allison, who repaired the dam (Betancourt, 1978b). By 1888, Frank and Warren Allison had bought the property, rebuilt the lake, and stocked it with carp (Betancourt, 1988; Holub and Bufkin, 1987).

Although not as significant to the community as the landscape elements detailed above, Nine Mile Water Hole, located at the confluence of the Rillito River with the Santa Cruz River, played an important role in life on the floodplain. Also known as Laguna, it was the site of an Indian village in the days before the Spanish conquest. Eighty to ninety farmers cultivated more than 500 acres around Nine Mile Water Hole in 1869. "Thus it is that civilization is irresistably (sic) and gradually pushing its way forward" (Weekly Arizonan, May 22, 1869). A tri-weekly mail station, later the Butterfield stage station, was established there in 1871 (Arizona Citizen, February
4, 1871). A humorous, but distinctly unfavorable view of the watering spot revealed at least one person's attitude toward the area in 1871:

The most remarkable characteristic of this 'Watering Place' is the strange influence it exercises on the health, and he who drink of its malaria flood and escapes the chills and fever, or some decease of a more dangerous character, is strangely constituted indeed. The frogs that inhabit this watering place are so reduced by sickness that they are unable to croak, or do not have enough ambition to do so, while the water snakes who eke out a hungry livelihood by swallowing those frogs are so enervated that once coiled up are unable to straighten themselves out. Yes, if you wish to appear ghastly, just go to Nine Mile Water Hole and take a drink—not of Whipple's whiskey, for that is good. (Arizona Historical Society transcript of article appearing in The Weekly Arizonan, April 8, 1871)

Of the landscape elements which figured prominently on the pre-entrenchment landscape of the Santa Cruz, fire destroyed the Silver Lake Hotel in 1890; floods destroyed Silver Lake and Warner's Lake in 1891. The destruction of Warner's Lake eliminated the power source for the mill; by 1891 Warner's mill had been abandoned and the house had been boarded up. Renovations in 1898 and within recent times have preserved the house, allowing it to be used again as a residence.

Leopoldo Carrillo's heirs sold his Gardens to Emanuel Drachman, who renamed it Elysian Grove, in the early 1900s. Entertainment productions were held there for some years, with patrons arriving by mule-drawn and (later) electric
streetcars. By 1929, however, Barrio El Hoyo had taken over most of the old resort and the rest was sold to the city, which built Carrillo School on the site (Sheridan, 1986).

The old mission beneath Sentinel Peak, the original San Agustin, continued to deteriorate over the course of the years. Rains melted the adobe; the earthquake of 1887 and erosion of the banks of the Santa Cruz River hastened the destruction of the buildings and their surrounding walls. Treasure hunters probed the ruins, and builders appropriated the bricks. (Hard and Doelle, 1978; Cosulich, 1953).

Conspicuous by their absence during the period shortly before entrenchment are any landscape features associated with the Tohono O'Odam, Piman, or Apache Indians who inhabited the area. Of the settlements which had existed in that location for upwards of 3,000 years no mention appears in the literature of the time. Except for unsubstantiated stories that the San Agustin mission at the foot of Sentinel Peak was built as an industrial school to train the Pimans or Apaches who began to settle in the area in the late 1700s, these populations might as well have been invisible. The San Xavier Reservation, created in 1874, gave the Tohono O'Odam some measure of control over the small scrap of the Santa Cruz River that was allotted to them, but encroachments on their land and water
continued well into the twentieth century (Brown and Ingram, 1987).

Likewise, use of the floodplain by women is also invisible in the literature. An examination of photographs taken in the late 1800s shows Mexican and Indian women doing their laundry on the banks of the river. While not the type of activity which produced permanent structures, such activity may well have had an important social component for the women themselves.

**Structural and Landscape Analysis**

Analysis of the period prior to 1890 reveals a landscape in which agriculture was a primary element both physically and symbolically. During the years preceding arrival of the Spaniards, the landscape reflected a social structure which was dominated by seasonal migrations between valley and mountains, and which functioned very much within the cycles of nature. Land and water resource rights were allocated in a usufructuary manner. Although some irrigation works were constructed, agriculture was closely linked to the natural regime of the river and was characterized by the planting of summer crops, which had origins in indigenous wild plants. The tensions which existed between Indian agriculturalists who sought to inject greater predictability and variety into their food
supply, and the vagaries of the natural climatic and fluvial regimes, were managed through the use of a variety of institutional practices, including construction of check dams, and planting of crops in areas kept moist by springs and seeps.

Resource utilization underwent major change upon the arrival of the Spaniards. Charged with securing the northern frontier of New Spain for the monarchy, and for effecting the transfer of wealth from the colony to Spain, the missionaries and (later) the soldiers brought with them very different traditions and ideologies from those held by the indigenous peoples. Intercultural tensions resulted, culminating in redefinition of the riverine landscape.

Among the changes introduced by the Spaniards were the introduction of new crops, the establishment of institutions associated with land ownership, and the practice of raising domesticated livestock. They also inhabited and used the floodplain year-round, with the result that local resources were utilized more intensively.

Analysis of the landscape created by the Spaniards reveals the existence of a social structure which attempted to manage tensions and reduce risk through greater domination of nature. The need of the soldiers survive in a hostile environment and to be able to carry out their campaigns against the Apaches was expressed in the
construction of permanent adobe structures and in the intensification of irrigated agriculture on the floodplain of the Santa Cruz River. The extensive cultivation of wheat, brought over from the Old World, and a general enlargement of the agricultural irrigation system itself reflect the degree to which the Spaniards transformed the landscape in accordance with their own social needs and expectations.

The necessity to "read between the lines" when analyzing the landscape as a text becomes particularly apparent in instances where domination of one culture over another is a major social phenomenon. Although Indians worked land near San Xavier Mission and maintained their presence at the foot of Sentinel Peak, the landscape over time revealed less and less of their practices and lifestyle. Although the social and institutional practices of the Indians produced landscape features which were characteristically non-permanent in nature, the complete absence along the river of landscape features which reflected the Indian culture reveals the degree of domination achieved by the Spaniards, and later the Mexicans, over the indigenous population. The San Agustín Mission, although constructed at the foot of Sentinel Peak at the behest of the Indians, reflects the extent to which the Spanish social structure (including military as well as religious and social rules and resources) came to
dominate that of the Indians.

As the Spaniards consolidated their control over the local area, they introduced their institution of water allocation and management. Rules regarding water rights were based on the concepts, developed as a result of their experiences in arid areas of the New World, of appurtenancy of the water to the land and of prior appropriation.

In regard to appurtenancy of water to land, it was customary for land grants to be designated in terms of parcels to which water rights were attached and parcels for which water rights were explicitly not available. The pre-1890 landscape reveals this structural and institutional arrangement in the patterns of land ownership and land use which occurred on the floodplain. The land grants along the Santa Cruz, as elsewhere in Nueva Espana, tended to be long and narrow in configuration, with the narrowest boundary being that which adjoined the river (Meyer, 1989). Irrigated agriculture appeared on the landscape only on those plots of ground to which water rights had been attached. The landscape of other property contained within the grant was that of the surrounding desert, often modified by the grazing of livestock on the native vegetation.

The prior appropriation rules, as developed within the social structuration process of the Spaniards in the New World, stated that the person who was first in time
with a water right had first right to the water needed to pursue his or her activities. This rule was expressed on the landscape in the form of the distribution of irrigated fields on the floodplain. Specifically, irrigated agriculture tended to be restricted to lands adjacent to, and south of, Sentinel Peak. These were the areas where the first rights had been granted and, therefore, were the lands to which water was first diverted. Since surplus flows frequently did not exist beyond Sentinel Peak after these prior rights had been satisfied, irrigated agriculture could only be undertaken north of Sentinel Peak during times of surplus, resulting in a landscape in that area which only occasionally included irrigated crops. It was this institution, and the resulting landscape configuration, which later figured in the conflict between those wishing to retain the existing social and political framework and those, such as Sam Hughes, wishing to change that framework and, consequently, the landscape.

During the Spanish era, management of risk was addressed through special rules governing water allotment during times of environmental stress. During such times, allocation of water could be reduced to the owner of the most senior right in favor of ensuring the welfare of all users who depended on that water. The responsibility for enforcing these arrangements and for mediating disputes was assigned, by the water users themselves, to the
zanjero. The zanjero was commonly chosen by the community from among its own ranks, thus ensuring, at least in theory, a degree of responsiveness to the concerns of the community at large. This arrangement, and the interaction among the individual agents, the rules, and the institution itself, was probably manifested on the landscape, in times of climatic stress, in the form of equally-flourishing (or stressed) crops in the fields cultivated by the various owners. The importance of this equality of crop status, in turn, reveals how tensions arising from climatic stress were resolved through acknowledgement that individual survival was inextricably linked to the survival of the community as a whole. Such placement of high valuation on community cohesiveness continues to be a strong element in the functioning of the local Mexican-American community.

Interestingly, although effectively marginalized from the dominant society, the local Indians were able to protect themselves to some extent by adopting the institution of prior appropriation in defense of their own water rights. The existing boundaries of the San Xavier Reservation, by encompassing a small portion of the Santa Cruz River, reveal the degree to which the Indians were able to employ Anglo legal and political institutions in the preservation and reproduction of their own society.

The importance of Spanish water law in the development of the Southwest should not be underrated. Adoption of the
concepts related to appurtenance of water to the land, and of the prior appropriation doctrine, were later seen by Anglos as valuable in reproducing their capitalistic ideology and social structure. To the present day, prior appropriation and appurtenance of water to the land are major features of Arizona water law. During the period prior to 1890, these concepts were manifested on the landscape in the pattern of land use, configuration of property boundaries, and pattern of irrigation canals. Where the Spaniards had created such a landscape mainly adjacent to, and south of Sentinel Peak, the Anglos extended the area devoted to irrigated agriculture, and developed lakes and recreational facilities. Such extension was facilitated by elimination of the Apache threat, greater capital and technological resources, and changes in the social framework through which legal and physical access to surface (or near-surface) supplies of water were allocated.

The orthogonal shift in orientation from north-south to east-west resulting from the gold rush and the acquisition of the area as a territory of the United States changed the spatial significance of Tucson. No longer the northern outpost of Mexico, Tucson became an important link between the center of power in the east and the repository of new wealth in the west.

While the agriculture practiced by the Spaniards and
Mexicans had never risen above a subsistence level, largely due to their inability to assert complete domination over the land and over the Indians, the agricultural practices of the Anglos who began arriving in numbers after the 1849 discovery of gold in California, quickly came to represent an ideology based on capitalism. This capitalism was most clearly manifested on the Santa Cruz landscape in the development of agricultural practices designed to yield surplus product which could then be translated into capital accumulation.

The extent and significance of agriculture along the Santa Cruz grew as the city's importance as a commercial center grew. Not only were crops being raised to support the local military, but also to feed the growing number of urban residents who were engaged in trade and other entrepreneurial pursuits which were characteristic of the Anglo social structure. Travelers passing through the area by stagecoach, and later by train, created a further market for agricultural produce. The landscape reflected these changes in the types of crops being grown. In particular, the appearance on the landscape of a Chinese population using large quantities of water to grow market garden crops not only resulted a change in the landscape, but played a significant role in the tensions which culminated in the W.A. Dalton et. al. v. Leopoldo Carillo et. al. lawsuit. Although the tensions associated with the administration
of the existing water allocation system were not resolved by the suit, subsequent attempts to sidestep the legal decision contributed to a major change in the landscape: entrenchment of the riverbed.

Associated with the growth of commercial agriculture and capital accumulation as institutions was the introduction of land speculation. Not only could capital be accumulated through the production of crops, but the land itself could be transformed into a commodity from which capital could be derived. Speculators drew freely upon a myth which was very popular in American society at the time, that of the yeoman farmer, to promote their interests. This transformation of nature into an expression of capitalism has remained an important feature of American social structure to the present day.

In the landscape of the years prior to 1890, the transformation was most clearly revealed in the change to cultivation of cash crops on already-developed land and in the division of additional land, particularly toward the northern end of the study area, into small farms which were marketed to easterners as being potential gardens just waiting to be cultivated. The subsequent failure of these small farms, and the consolidation of parcels into larger holdings and cultivated for cash crops, was yet another manifestation of the ways in which transformed nature came to symbolize capitalism.
Financial resources played other significant roles in the development of a distinctively Anglo social structure, as evidenced in certain landscape elements which appeared along the river. With substantial capital at their disposal, and access to relatively sophisticated technology, merchants such as Warner, Lee, and the Rowlett brothers transformed the riverine landscape by building structures which took advantage of the water power of the Santa Cruz. The resulting landscape, that of dams, lakes and flour mills, symbolized the Anglo reliance on technology to enable their culture to exist outside of nature. The flour mills themselves exemplified the entrepreneurial spirit of the Anglos who saw profits to be made from selling flour to residents and to military outposts in the area.

After the arrival of the railroad and concomitant transformation of Tucson into an American version of Victorian society, water-based enterprises such as Silver Lake and Carrillo's Gardens became symbolic representations of the wealth of the community. The existence of the gardens and resort facilities reflected the transition from a frontier outpost to a more orderly society in which a livelihood could be earned with time and money to spare for leisure pursuits. Given the climate and the scarcity of bodies of water in the area, it is not surprising that such lavish uses of water would be made an expression of local
values and ideology.

It is significant that these facilities came under little pressure from other institutions engaged in extracting water from the Santa Cruz and its floodplain. The value of these landscape elements as amenities within the community was such that compromises were negotiated whereby the water in Silver Lake would be released for agricultural uses at certain times, and retained behind the dam to maintain the lake's level the rest of the time. Likewise, Carrillo's Gardens came under no apparent pressure to relinquish water for other uses.

The controversy over Warner's Lake, on the other hand, symbolized the growing restiveness of landowners north of Sentinel Peak over the lack of water available to allow them to develop their lands for more intensive agriculture. His appropriation of substantial portions of surface water and his ambitions to enter into direct competition with the Silver Lake resort by developing his own resort were early harbingers of the tensions that would eventually surface as more and more users competed for a diminishing supply of available water.

The confrontation which arose in 1884 over water rights upstream and downstream of Sentinel Peak was a manifestation of the social and economic tensions associated with further expansion of agriculture on the floodplain. Although the agricultural practices of the
Chinese played a peripheral role in the dispute, ethnic divisions played no direct part in the litigation. Rather, the dispute took the form of a direct challenge to the institutionalization of the prior appropriation doctrine within the social process of the community. While the system adopted from the Hispanics had worked well as long as water use remained reasonably in balance with the resources available, it came under increasing strain as the drive for capital accumulation, as expressed in efforts to develop marginal lands for commercial agriculture, intensified. The court upheld the prior appropriation rights of the senior users, but could not stop the drive toward capital accumulation as it was manifested in commercial agriculture practices. The first challenge to the court's decision was made by Sam Hughes when he created his ditch in an effort to bring formerly-denied water to the downstream acreage he owned. Abetted by unusual flooding, the ditch Hughes dug became the final straw leading to entrenchment of the river.

The recursive relationship among the society, its institutions and its physical environment were brought into sharp focus by the flooding and subsequent entrenchment of the river. The entrenchment of the Santa Cruz required institutional reconsideration of the policies and procedures under which water was acquired and allocated. This reconsideration led to a response which illustrated
the extent to which the need for a steady and predictable water supply for further growth and development drove the decisions which were made. In effect, the response was to reinforce the dominant social structure which, by that time, had come to include such social values as irrigated lawns, shade trees, running water in homes and businesses, and agricultural and commercial development. This development was achieved by intensifying the search for water, rather than by trying to restructure the social, political, and economic institutions to bring them more into line with the water which was available. Reliance on technology to solve the city's water problems increased as the value of investments in the area increased. The combination of reliance on technological solutions, and increased complexity of local and national institutional relationships, contributed to a decrease in the flexibility of those institutions to respond to changes in the natural regime.

By 1890, Silver Lake and Warner's Lake had been destroyed. Although Carrillo's Gardens and Levin's Gardens continued to serve as gathering points for members of the community, water-based leisure and recreation along the Santa Cruz disappeared from the practices and dominant discourse of the community. The disappearance of these landscape elements as symbolic manifestations of the local society was the first indication of a social restructuring
which would eventually result in a redefinition of the landscape from that of a vital water and land resource to that of a repository for the community's wastes. Likewise, the gradual decay of the San Agustin Mission reflected the growing division between the Hispanic and Anglo communities and presaged the disregard with which Hispanic contributions to local culture would later be treated.

Summary

The changing landscape of the Santa Cruz River has reflected the dominant social structures of the societies which established themselves in the area. The landscape evidenced a progression of textual significances, beginning with indigenous Indians' seasonal agricultural practice which was largely in harmony with nature.

The next phase, the Spanish/Mexican period, was characterized by year-round subsistence agriculture based on imported species and regulated through land and water allocation policies and institutions. Agricultural activity at this time was largely geared toward maintaining a missionary (and later) military presence on the frontier. The construction of the San Agustin Mission during this period was significant for its representation of the Hispanic dominance over the indigenous tribes. The
physical, socio-cultural, and institutional marginalization of the Indians which occurred during this era was reflected in the disappearance of expressions of their culture on the landscape.

The final phase during the period prior to 1890 was characterized by increasing Anglo dominance of the area and the legitimization of Anglo political, economic and social institutions through formalization of land ownership, allocation of water and water rights, and development on the riverine landscape of features expressive of the capitalistic appropriation of agriculture, utilization of water as an expression of wealth and leisure, and introduction of technologies designed to promote the full development of a market economy. Political power shifted decisively from Hispanics to Anglos during the latter part of this period. As Anglo domination increased, Hispanics were presented with the dilemma of adopting American economic and social institutions or maintaining their traditional cultures at the risk of finding themselves increasingly marginalized. While interactions between Hispanics and Anglos remained relatively open throughout the period, ethnic separation became increasingly institutionalized and was spatially manifested in the development of Hispanic neighborhoods south and west of the railroad and growth of Anglo neighborhoods to the north and east of the tracks.
The appearance of the landscape itself underwent major changes during the years before 1890. In the early days, the Santa Cruz River had been bordered by simple fields of beans, corn, and maize, and by the habitations of a semi-nomadic people who built few structures which could be construed as permanent. The social organization of the inhabitants reflected the yearly migration to mountain waterholes in the winter and to the floodplain fields in the summer. The necessity of surviving in an environment characterized by significant fluctuations in precipitation led the Indians to employ a number of techniques to reduce the risks to their survival. Among these techniques was the practice of settling near dependable surface flows or springs during the farming season, and practicing ak chin agricultural techniques on the lands they farmed.

The arrival of the Spaniards resulted in the transformation of the landscape into a highly engineered system of irrigation channels which eventually obscured the natural course of the river. New crops were introduced, notably wheat, which was cultivated during the winter season. Livestock were also introduced. Inhabitants built permanent adobe structures and lived in them year-round. Throughout the Spanish and Mexican periods, water use remained more or less in balance with surface supplies, due to lack of more sophisticated technology and to Apache depredations.
The California gold rush, the Gadsden Purchase, and a national policy promoting the settlement of the west spurred an increasing flow of Anglo migrants to the Tucson area. Bringing with them perceptions and practices developed in the more humid areas from which they came, the new settlers generated unprecedented demands upon local water supplies. They also created a number of new features on the floodplain, and redefined the riverine environment to accord more closely with their expectations and experiences.

At the same time that Tucsonans were recreating at Silver Lake and Carrillo's Gardens, and hunting ducks on Warner's Lake, they were engineering a city water system, planting trees and lawns, and expanding agriculture on the floodplain. Such demands encouraged attempts to further develop surface and subsurface flows, especially through the excavation of ditches to intercept flow farther and farther upstream of the town.

These actions, together with a number of other factors such as climatic change, overgrazing, development of wagon roads and stock paths, etc., resulted in the entrenchment of the river which began during the floods of 1890. Development of the arroyo, where a nearly at-grade streambed had previously existed, caused the loss of perennial flow in the river. Entrenchment also resulted in a drop in the water table, thus eliminating many of the
springs upon which townspeople relied. The stage was thus set for an intensification of efforts to develop what surface and subsurface flows remained, and for investment in new technology which promised to give access to water existing at greater depths.
CHAPTER 5

THE LANDSCAPE AND ITS CONTEXT: 1890-1920

The period between 1890 and 1920 was a transitional era, which began with the entrenchment of the Santa Cruz River and culminated in the disappearance of the last community within the study area, Los Reales, to engage in agriculture irrigated by surface flows from the river.

The time period after initiation of entrenchment along the Santa Cruz River was characterized by an almost mythological quest for a subterranean source of water to support the burgeoning population and established institutions, especially agriculture. The belief of the time was that an artesian flow, or underground river as it was sometimes called, existed in quantities large enough to sustain unlimited development. At the same time that the search was on for water from subsurface sources, however, new water pump technology, developed in California, also began to appear in a large way around Tucson. Both surface flow development and groundwater extraction became major projects during these transition years.

In terms of weather, the transition years were characterized by persistent drought which caused a precipitous drop in the size of cattle herds, stimulated a shift from ranching to farming, and resulted in the
introduction of hay and alfalfa as major crops. Drought conditions became so severe in the summer of 1892 that Mayor Maish shut off the water mains to city parks in an effort to conserve water (Kupel, 1986). The following year limitations on watering were suggested:

It has been suggested that some plan should be adopted by which all irrigation of gardens, lawns and trees in Tucson should be done from 6 pm to 4 am. (Arizona Daily Star, February 15, 1893)

Floods created much damage in August 1895, but the drought returned more strongly than ever from 1899 to 1904. During this drought, the ideas voiced in 1893 about restricting irrigation hours were put into effect:

Sprinkling and irrigation [will be] allowed only between the hours of 5 a.m. and 8 a.m. and between 5 p.m. and 8 p.m.... Trusting that the fairminded citizens of Tucson will bear with us in this proposition. (Arizona Daily Star, June 19, 1903)

By 1905, however, weather conditions had changed yet again, and Tucson experienced its wettest year of record, 24 inches of rain, most if it falling from January through April (Holub and Bufkin, 1987).

From 1880 to 1907 Tucson was characterized by a boom/bust economy based on the fortunes of the mining industry (Bufkin, 1981). The period saw considerable inmigration, particularly from more humid areas of the
country as the city expanded from being an agricultural and railroad center to serving also as a tourist and health center. All of this development created significant pressures upon available supplies of water.

Local boosterism was begun in 1896 with the aim of encouraging people to come—and bring their money—to Tucson. New development around the city occurred mainly to the north and east. This growth was spurred by the arrival of the Southern Pacific Railroad in 1880, the establishment of the University of Arizona in 1891, and the construction in 1898 of a trolley car line connecting the university with the town (Bufkin, 1981).

The period from 1900 to 1920 was a time of federal government involvement in irrigation development through the National Reclamation Act, passed in 1902, which funded irrigation projects. Interest in irrigation projects increased land values and stimulated speculation, including participation by wealthy outside investors (Kupel, 1986). By this time, Anglos had become the dominant figures in agriculture throughout the Tucson Basin.

Population in Tucson grew from 7,250 in 1900 to 13,193 by 1910 (Kupel, 1986). The town did not begin to stretch the original two-square-mile boundaries laid out by the early town fathers, however, until 1912. Although the automobile became the dominant mode of transportation by
1920, the Southern Pacific Railroad remained the main employer in town.

With the new availability of oil emanating from the oil boom which began in Texas in 1901 and grew to include newly discovered fields in California, a cheap and abundant source of fuel to drive the pumps was finally available. The development of pump technology allowed individual farmers to control their own water in a manner which had never before existed in the basin. No longer did farmers have to cooperate with their competitors in the allocation of a scarce resource. This event would have a profound effect on the landscape of the Santa Cruz floodplain, for it would allow inhabitants to pursue their livelihoods completely independently of the river as a source of water. Acreage under cultivation increased in the basin, particularly in the north around present-day Marana, and in the south in the area of Midvale Farms.

The engagement of the United States in World War I increased copper mining in Arizona and encouraged the cultivation of large crops of cotton to replace sources no longer available from Egypt. The cultivation of cotton required considerable quantities of water and land, developed through corporate enterprise.

The introduction of new technology, especially gasoline and electricity-driven pumps had an especially heavy impact on water development in the Tucson basin.
The effect of government participation in irrigation enterprises, and governmental encouragement of private investment in irrigation works, resulted in increased land speculation and elevated land prices. Investment schemes, often designed to entice farmers from the east and midwest to come west and purchase land from the speculators, proliferated. The immigrants who responded to speculators' promotional activities brought with them images, habits and expectations born in more humid regions, thus aggravating the inability of the region to live within its existing water resources. The desert was to be transformed into a garden, according to the influential people of the day. The newcomers brought another piece of baggage with them as well: unlimited faith in technology to solve any problems they might encounter. California, the "cradle of western irrigation technology" (Kupel, 1986, p.85), was highly influential in the development and introduction in dry lands of well-drilling and pump technology.

Throughout this period, efforts to augment the water supply pursued two paths simultaneously: development of perceived artesian and underground river resources, and exploitation of groundwater. The landscape of the Santa Cruz River reflected both of these trends, with the efforts to develop artesian flows and tap groundwater showing up in a network of canals extended ever farther upstream to capture surface and subflows, and installation of pumps in
the riverbed and on the floodplain to extract deeper water deposits.

Continued entrenchment of the river, when linked to observed decreases in water availability, led some observers to connect the two phenomena. Such observations were, in fact, portents of what would occur in subsequent years as the city turned away from the river and concentrated on development of groundwater resources.

The Transitional Landscape

The landscape of the transition period was characterized by the disappearance of Silver Lake and Warner's Lake, and the development of a deeply eroded, essentially dry, arroyo in the Santa Cruz River.

The San Agustin mission complex continued to erode. By 1891, Sam Hughes had cut openings in the remains of the main building and was using it to stable his livestock (Arizona Daily Star, March 14, 1937). However, from the 1880s onward, notwithstanding such modifications, the large number of individuals who photographed the mission ruins suggests that the ruins were a favorite recreational destination as well as a favorite photographic subject.

In 1888, a new community, Los Reales, appeared on the Santa Cruz landscape. Formed by a group of Mexican-Americans who had been evicted from their farms when the
San Xavier Reservation was formed in 1874, the small community was made up of adobe houses lining the main street. Two general stores and a blacksmith shop served the town, but the main occupation of the residents was farming. The town's significance as a landscape feature lies in its role as temporary stopping point for a group of Mexican-Americans who were seeking to eke out a livelihood in the face of adverse political, social, economic and natural conditions. Soon after the town was established, changes in the environment, notably activities undertaken by the Tucson Irrigation Company and Midvale Farms, changed the stream's regime to the point that the residents of Los Reales were no longer able to pursue their customary agrarian activities. Unable to make a living, the residents departed, leaving the town totally deserted by 1920 (Betancourt, 1978b).

Flooding resulted in considerable landscape changes in 1890. The extent to which the floods of 1890 changed the landscape of the floodplain was described in contemporary accounts:

More than fifty acres of land which has formerly been under cultivation in the Santa Cruz bottom, has been rendered worthless by being washed out so as to form an arroyo (Arizona Daily Star, August 8, 1890).

The single channel which was being washed out through the fields of the Santa Cruz by the floods, resulted in considerable damage but this danger has been greatly increased from the fact that the wash or channel has forked at the head and there are now several channels being cut by the flood, all of which
run into the main channel. If the flood keeps up a few days longer there will be hundreds of acres of land lost to agriculture. . . . Those who have visited the site say that it is not too late yet to direct the water so as to cause it to cut a single channel and thus confine the flow. In view of the probable great destruction it would be well for some one to lead off in this manner (Arizona Daily Star, August 9, 1890).

The raging Santa Cruz continues to wash out a channel and the head of it is now opposite town. It may reach Silver Lake before the rainy season is over (Arizona Daily Star, August 14, 1890).

The Santa Cruz is getting down to its own little bed. The head of the new channel of the Santa Cruz River is now opposite Judge Osborne’s place on the road to Silver Lake (Arizona Daily Star, August 29, 1890).

The big arroyo cut through the Santa Cruz Valley will afford the means of drainage for the city. It is an ill wind that does not bring good to someone (Arizona Daily Star, August 9, 1890).

As soon as the waters subside some steps should be taken towards preventing the river from continuing its ravages again next summer (Arizona Daily Star, August 26, 1890).

Even after entrenchment of the river, contemporary photographs reveal that agriculture continued to be the main pursuit on the floodplain. Trees continued to shade the river's banks and Carrillo's Gardens continued to be used by picnickers. Women were able to find enough water, at least some of the time, to continue washing laundry in the river.

A call for reorganization of the water system in order to support irrigation facilities was made during the floods of 1891 (Arizona Daily Star, August 26, 1891). To an
increasing extent, however, the fields came to be watered not from the river and the springs that fringed it, but from fossil groundwater pumped out of the ground by increasingly sophisticated pumping technology. W.A. Hartt has been credited with establishing one of the first pump-irrigated farms in Southern Arizona (Kupel, 1986). Others soon followed suit. Water development for metropolitan Tucson in particular came to rely more and more on pump technology to capture and deliver water for commercial, industrial and residential uses. The city, which had bought the Tucson Water Company by 1900, invested more and more heavily in pump technology to supply municipal needs. Their primary source of water, located along the Santa Cruz south of town, was a 720-acre parcel of land known as the City Water Farm (Kupel, 1986).

At the same time, extensive efforts were undertaken to try to capture the underground flow that many were convinced occurred under the floodplain. The idea of tapping artesian flows had been a prominent feature in American water development discourse since the mid-1870s. Earlier attempts at capturing artesian flows in Tucson had been initiated by T.J. Jeffords in 1881 (Kupel, 1986), but success was not achieved until 1882. Unfortunately, even these efforts proved insufficient to the task of delivering sufficient supplies of water to the town. Artesian flow continued, however, to be sought by developers, especially
corporate interests, who wanted to expand agricultural production on the Santa Cruz floodplain.

In 1892, Frank and Warren Allison developed an irrigation ditch at the foot of Sentinel Peak, above the old Warner mill (Betancourt, 1988). The ditch was designed to capture the water of the cienega which had been contiguous to Warner's Lake as well as the "underground currents which flow out from under the mountain" (Arizona Daily Star, January 16, 1892). The enterprise, cited as one of the largest of its kind in the area (Arizona Daily Star, July 21, 1892), directed the water to land which had been rendered unsuitable for agriculture by the development of the arroyo in the river bed.

The object in constructing the ditch is to supply the vast acreage of rich land lying between the city and the foot of the mountains with sufficient water for irrigation purposes. Much of the land there which is capable of a high state of cultivation is devoted to raising hay and alfalfa where if water could be set to fruit trees and would soon become one of the largest fruit growing sections in this part of the territory (Arizona Daily Star, July 21, 1892).

By 1896, the Allisons discovered that their operation was unsatisfactory, due to the high alkalinity of the soil on the west side fields, so they dug a canal, dubbed Flowing Wells, on the east side of the floodplain. This time the water works constructed by the Allisons included a flume to carry the water across the Santa Cruz River to
L.H. Manning, inspired by the Allisons' success, tried his hand at developing artesian flow at the base of Sentinel Peak:

There is good reason to believe that at depth a large and permanent supply of artesian water can be obtained. The successful experiment of Manning and Ives on the Allison ranch Tuesday in developing the underflow in the vicinity of the Allison brothers experiment some years ago is most encouraging. It is evident the water is still there and in large quantities (Arizona Daily Star, May 1, 1902).

The artesian water question has been determined in the Santa Cruz Valley. Yesterday Captain Fulton, the manager for General L.H. Manning, struck the fifth flow of water. . . . The cold, clear water spouts out with force. . . . [General Manning] feels confident that he has struck a subterranean river and the flow would seem to warrant the belief. . . . One of the interesting features of these wells is that not one of them has depreciated in flow since developed yet this is our very driest season (Arizona Daily Star, July 10, 1902).

The experiments made in developing artesian water in the Santa Cruz River in such large quantities . . . demonstrates the theory of a large underflow in this valley. It also demonstrates that this underflow can be brought to the surface with little cost or trouble. . . . This underflow can be tapped at scores of points south of Tucson at most any point in the valley. Two, three, or five miles up the Santa Cruz Valley would no doubt develop water sufficient to supply the entire demand of the city. There is believed to be a very large underflow in the valley, sufficient to irrigate the many thousands of acres. This can be brought to the surface and made to do duty in the reclamation of lands (Arizona Daily Star, July 30, 1902).
Optimism about sufficient water was short-lived, however. By 1903 decreased flow, increased consumption, and drought had combined to create shortages, necessitating the imposition of rules limiting the hours during which lawns and gardens could be irrigated (Arizona Daily Star, June 19, 1903). The wettest year of record, 1905, brought floods and consequent damage to bridges in the area. Also in 1905, officials observed that water shortage problems experienced in Tucson resulted from the entrenchment of the Santa Cruz River. The arroyo was drawing off the underflow "which previously formed a vast underground reservoir and from which the city wells drew their supplies" (Arizona Daily Star, June 24, 1905). These observations were echoed by scientists working in the Tucson area in the 1910s, who observed that the river bed "must act therefore exactly like a drainage canal in underdraining the valley. . . . It is probable that as this underdraining continues the water level will be lowered considerably along the valley. . . ." (Smith, 1910, cited in Betancourt, 1988). During this time, four main canals, including those developed by Manning and the Allison brothers, were used to irrigate floodplain lands along the Santa Cruz.

The Tucson Farms Company, one of the largest agricultural enterprises to appear in the second decade of the twentieth century, represented the transition from individual to corporate development of land and water.
The company's real estate included acreage between the city limits and the San Xavier Reservation, and some land two and one-half miles north of the city. The investors in the company dreamed of building a local agricultural empire based on these holdings. However, their ambitions hinged on being able to augment their water supplies. To this end, their most significant effort was a water development scheme which consisted of a series of nineteen electricity-powered wells drilled across the river bed at the foot of Sentinel Peak. The operation, known as the "Crosscut", became one of the most prominent features on the transitional landscape of the Santa Cruz floodplain. The Crosscut system was attached to seven miles of concrete-lined earthen canal and twenty-one miles of irrigation ditches (Betancourt, 1988).

Although the company was producing 30 million gallons of irrigation water per day by 1915, cash flow problems forced the company to begin selling off its land by the end of the decade. The land eventually passed to the Flowing Wells irrigation District and to the Midvale Farms Company (Kupel, 1986).

During World War I, cotton became a major crop on the Pima County landscape. Pump technology having been developed by this time to a degree that allowed inexpensive extraction of fossil water from the underlying aquifer made possible the cultivation of crops on expanses of land far
The ascendancy of the Cortaro and Marana areas as the focus of agriculture in the Tucson basin can be traced to the first decades of the twentieth century when war demands and speculation activities, particularly by Edwin R. Post, opened up vast new acreages to cultivation based on pumped groundwater.

Flooding during the winter of 1914 prompted a flurry of flood control activity, including the creation of a diversion channel from the west branch to the main stem of the Santa Cruz River. The construction of the diversion channel, on the San Xavier Reservation, turned the west branch of the river (which until this time had actually been the main stem of the river) into an ephemeral remnant, and shifted the flow permanently into Spring Branch (formerly a branch of the main channel) (Betancourt, 1988).

The considerable investments that had been made in water acquisition projects, agricultural enterprises, bridges, etc., guaranteed that monetary losses from flooding would increase dramatically. And such was the case along the Santa Cruz. The 1915 floods resulted in losses estimated to reach at least $50,000 (Arizona Daily Star, February 3, 1915). Flooding in 1915 and 1916, by destroying the bridges spanning the river, also caused havoc by cutting off travel between Saint Mary’s Hospital and the Carnegie Desert Laboratory on the west bank from the city on the east bank.

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Structural and Landscape Analysis

The transitional period was characterized by increased efforts to extract water to fuel growth and by the resulting reduction in supplies of easily-accessible water along the Santa Cruz River. Entrenchment proceeded in the upstream direction, causing a drop in the water table and a consequent loss of much of the riparian vegetation which had provided aesthetic value to interpreters of the riverine landscape. Agriculture continued to constitute one of the most important landscape features along the river, but was supplied more and more through pump technology rather than by gravity flows of surface or near-subsurface waters.

The development of the Crosscut system, one of the most significant new landscape features to appear along the river during this era, exemplified the extent to which nature was becoming dominated by human application of technology. The significance of the Crosscut as a landscape element is revealed by investigating the reason why it was built. The system was developed for the purpose of speculation, the aim being to profit from expansion in the amount of irrigable land which could be sold to individual farmers. The institutionalization of such large land and water development schemes, requiring substantial infusions of outside investment capital, were
representative of the intensification of interest on the part of investors wishing to build agricultural empires and of speculators expecting to reap profits from buying land in anticipation of a rise in its value.

The increasing reliance on water from subterranean sources resulted in a significant change in the social discourse regarding the relationship between land and water. Unlike the previous era when water was visible and easily applied to adjacent land, the development of subsurface flows and reliance on pumps to extract water from beneath the surface served to remove awareness of water and its sources, as well as of its relationship to other natural features, from the public mind. Instead, artesian flows and the idea of an underground river became prominent in the social discourse and were manifested in numerous schemes designed to tap such flows to support particularly urban growth. On the landscape, these schemes resulted in projects such as the Crosscut System which combined wells, mechanisms to trap artesian flows, and canals to carry the water thus produced.

The interaction between the physical environment and Anglo political and economic institutions produced a cycle in which substantial investments in development of subterranean flows were followed by increased flows. Rapid depletion of these flows, in turn, set off another round of water development activities. The structuration process
which this cycle exemplified was itself a reflection of the limitations the community faced, prior to full development of pump technology, in attempting to enhance water supplies quickly and substantially enough to keep up with increasing demands. In the long run, these projects effected long-term changes in the landscape by accelerating the depletion of surface and near-surface water supplies, which in turn led to depauperation of vegetation on the floodplain and to the abandonment of the community of Los Reales for lack of water with which to irrigate their fields.

In addition to water development schemes such as the Crosscut system, other important changes occurred along the river. One of these was the expansion of agriculture. Given the pattern of previous development in the Tucson Basin, the largest and most available tracts of land for development of irrigated agriculture were those to the north of the original settlement. Therefore, it was in this direction that agriculture grew. At the same time, agricultural lands near the historic center of the settlement began to be abandoned. A textual reading of these changes reveals the important role played by the community's increased reliance on pump technology, intensive land speculation activity in the conversion of large tracts of desert to irrigated agriculture, and the depletion and degradation of some of the oldest agricultural areas.
In addition to the involvement of private speculators and investors described above, the institutional involvement of the federal government in irrigation projects promoted the development of new lands for agriculture. Of particular importance in this regard was the passage of the National Reclamation Act in 1902, which represented the first time that federal funding was made available for the construction of irrigation works (Kupel, 1986).

Development and extensive cultivation of the lands now encompassed by the town boundaries of Marana was stimulated when the outbreak of World War I generated a considerable demand for cotton. The devotion of large tracts of farmland to cotton effected yet another modification in the riverine landscape. Cotton, as a cash crop, changed the course of agriculture from provision of foodstuffs to production of a raw material which was shipped to distant locations for processing and conversion into finished products. Like mining, cotton production can thus be defined as an extractive industry. The development of such an extractive industry constituted a major change in the meaning invested in the agricultural landscape. The change was one which was entirely at odds with the earlier symbolism of agriculture as a realization of the ideology associated with the yeoman farmer maintaining his self-sufficiency through the cultivation of crops such as wheat.
and corn. The dominance of cotton as a landscape element along the Santa Cruz also symbolized the extent to which the community had come to rely on modern transportation to acquire food from other agricultural areas. The link with the war effort, and the reliance on imported products, demonstrate the degree to which Tucson had become integrated into the national political and economic scene.

A closer look at the utilization of pump technology as a feature on the landscape reveals not only increasing sophistication in the technology itself, but a substantial reduction in the cost of employing that technology. In effect, the costs of growth decreased as inexpensive pump technology paved the way for even greater growth.

Expansion of both residential and commercial development was facilitated by the introduction of the new pumps, many of which were installed on the river floodplain. As the transitional era drew to a close, and as pump technology released the city from its dependence on the river, the community expanded toward the east and the river disappeared as an iconographic symbol of the community's ideology and social reproduction.

At the same time that agriculture was expanding toward the north, and Tucson was expanding toward the east, the community of Los Reales was being established and abandoned along the Santa Cruz River. The town itself, as a landscape feature, symbolized the conflicts associated with
competition for land adjacent to the Santa Cruz River. Establishment of the San Xavier Reservation south of Tucson, in 1874, had by 1890 resulted in the displacement of an entire community of Hispanics. The Hispanics, who were forced to move off the lands awarded to the Indians, responded to their displacement by establishing a new town just outside the reservation boundary in an attempt to preserve their community and social structure.

While removal of the Indians from the physical and symbolic landscape was completed with the establishment of the reservation as a federally supported institution, the establishment of Los Reales created a significant social presence along the river. As a symbol of social process, the town represented the class conflict between the Hispanics who were struggling to sustain themselves and their culture in an area they had occupied for many years, the Indians who claimed their rights based on historic occupation, and the Anglos who were rapidly acquiring land in the area and transforming it into expressions of the capitalism which drove American social, political and economic endeavor.

The very transitory nature of the town of Los Reales, its lifespan covering thirty years at the most, reveals how hopeless the efforts were to pursue a subsistence-level agricultural lifestyle, given the loss of surface flow and drop in the water table. Lack of water drove the people
off the land, and Los Reales disappeared from the landscape and from the social discourse of all but a few former residents.

During this era, the San Agustin Mission continued its deterioration, further evidence of how the authorship and symbolic value of historic landscape elements along the Santa Cruz River were disappearing with the consolidation of Anglo-American power. Although apparently a favorite excursion destination and photography subject, the mission failed to stimulate the kind of iconographic signification which would have resulted in its preservation.

**Summary**

Social and physical transition along the Santa Cruz River during the transition period was most clearly expressed in the form of water augmentation schemes designed to intercept perceived underground flow and to tap deposits of water located at greater depths. The force behind these efforts was the momentum of social and economic growth. Land speculation and development of more sophisticated technologies for the extraction of water exemplified the continued power of capitalism as the driving force in American society and the growing distance between the society and nature.
Local institutions reflected the continued growth and development desired by investors and owners of commercial enterprises. Unabashed boosterism entered the local discourse as influential individuals added the healthfulness of the climate and value of the area as a tourist destination to the social definition of Tucson.

The elements of the Santa Cruz River landscape which best symbolized the technological inclination and big-capital speculation characteristic of the era were water development projects such as the Crosscut system. The movement of agriculture northward into previously unfarmed area, and the appearance of cotton as a major crop represented a change in social structure toward intensified efforts to extract profit from the cultivation of particularly non-food cash crops, rather than to produce food to be consumed locally, and reflected the extent to which Tucson had become incorporated into the national economic and political framework.

The shift in agricultural focus along the Santa Cruz River from the area west of Tucson to the Marana area on the north indicated the extent to which agriculture was decreasing in importance within the economic and social environment of Anglo Tucson. To the extent that, over time, agriculture became thus marginalized, it ceased to play an important role in the social construction of the
riverine landscape. In essence, it became a relict landscape element.

In the south, a remnant of the Hispanic population struggled in Los Reales to preserve their way of life based on subsistence agriculture. While the dominant Anglo and marginalized Hispanic cultures coexisted in space, the ability of Hispanics to maintain their cultures and lifestyles outside of the mainstream was increasingly threatened by the loss of easily accessible water, lack of access to capital for investment, and by the consolidation of Anglo-American power within the local social context.

The landscape of the transition period was characterized by entrenchment of the river, with consequent loss of surface flow and a drop in the water table. Many landscape elements which had played an important role in the life of the community in prior years were destroyed by floods or deteriorated through neglect.

During these years, development of water resources passed from the control of private entrepreneurs to corporate speculators. Attempts to develop artesian flows dominated much of the activity in the early transitional period; however, by the 1910s pump technology gained ascendancy in the efforts to wring more water from the desert. Cheap oil, newly discovered in Texas and California, made it possible for people to mine groundwater at low cost, thus decreasing their dependence on the
capriciousness of the climate and the river. As reliance on the Santa Cruz as a major water source declined, the landscape of the river and its floodplain underwent a transformation from being a representation of the interaction between people, institutions, and the physical environment to being one of neglect and dereliction.
CHAPTER 6
THE LANDSCAPE AND ITS CONTEXT: 1920 TO 1974

Land uses and activities along the river during the years 1920 to 1974 reflect a decreasing interaction with the Santa Cruz as a riverine environment. This decrease in interaction led to the development of features along the river and its floodplain which provided no opportunity for the community to invest meaning or significance in the river as a "river". The river became, in effect, invisible to the majority of the area's inhabitants and their institutions.

Beginning in the early 1900s there was, however, an increase in knowledge about how desert streams behaved. Since most scientific knowledge about stream hydrology had been developed in more humid areas where streams had defined banks and water flow all year, it was not surprising that scientists, as well as farmers and entrepreneurs, saw the Santa Cruz River in the same way. This vision began to change after publication in 1939 of Godfrey Sykes' study of desert streamways (Sykes, 1939). Sykes subdivided streams into three categories: through-flowing (the streams of more humid areas); intermittent (which arise in the mountains and sink into the desert) and arroyos (which only carried running water when precipitation occurred). He identified the streams of
Southern Arizona as being in the "intermittent" category. He credited modern pumps with enabling modern agriculture to realize its potential and considered subflow to be by far the most important factor in the region's development. A person of his times, he acknowledged that the limits to agricultural growth might be at hand, but believed that enough untapped resources remained to support all "proximate purposes of industrial, municipal, and specialized farming expansion (Sykes, 1939, p.83).

After World War I, business boomed but agriculture went into a serious economic downturn which began in the 1920s and lasted through the Great Depression. Little in the way of water development occurred during these years; rather, increasing reliance was placed on pumped groundwater for all water uses.

Notably, no large agricultural projects were begun during this time period (Kupel, 1986). Perhaps most representative of the difficult times faced by farmers in the 1920s and 1930s was the Post project near Marana. Post, who purchased a large tract of land between the Rillito Narrows and Marana in the hopes of selling off parcels to immigrant farmers, went bankrupt in 1920. The land development was taken over by the Pima Farms Company and water operations were assumed by Catalina Water Company. However, due to high costs and low prices, Pima Farms Company and Catalina Water Company entered voluntary
bankruptcy in 1927. Court action created two new companies in 1929, the Cortaro Farms Company and the Cortaro Water Company, to manage the land and water resources. The Cortaro Farms Company, in turn, entered voluntary bankruptcy in 1932, with the assets being transferred to the Marana Irrigation Company in 1934 (Kupel, 1986).

The years of low agricultural prices took their toll on the farmers during the years after World War I and during the Depression. However, renewed market opportunities generated for cotton during the World War II and Korean War years gave new life to agriculture. Government price supports for cotton also encouraged expansions in acreage (Arizona Daily Star, April 5, 1946).

What development there was in the Tucson area during this time period turned from agricultural schemes to urban development. The Sunshine Climate Club extolled the virtues of Tucson and made a point of flatly denying that Tucson was in a desert. The Chamber of Commerce launched an active campaign to draw tourists and health-seekers. Population increased from 20,292 in 1920 to 32,506 in 1930 (Kupel, 1986). Combined with population growth was the continuing problem of inadequate water availability. A water shortage in 1920 prompted officials to limit lawn and garden irrigation to evening and early morning hours. Water shortages, however, did not stop the development boom. Rather, the city floated a bond issue in 1920 which
was used to expand its pump facilities and build a reservoir at Campbell and Second Streets. Ordinance 563, passed in 1924, required all new water services to be metered. At this time, only 53% of the water connections were metered (Kupel, 1986). Another bond was floated in 1927 for water improvements.

Beginning in 1929, however, the city began a different method of developing its water supplies: it started purchasing private water companies. This decision quickly resulted in the transferral of water developed for agricultural irrigation to municipal uses, a trend that became institutionalized in later years.

The image of the west as a garden faded with the onset of the Great Depression, as did the vision of the yeoman farmer working his own fields. It became abundantly clear that the economic future of agriculture lay in large corporate enterprises supported by substantial financial resources. Such corporate farming gained momentum toward the end of the 1930s, when agricultural production again focused on cotton. Concern over dropping groundwater levels receded into the background as support for America's war effort became a foremost concern.

The increasing sophistication of pump technology and the availability of inexpensive fuel to power those pumps provided area residents with an ostensibly inexhaustible source of water. Of perhaps equal importance, it provided
individuals and water companies considerable independence in making decisions about how and when to use their water, and about how much of that water to use. The advent of accessible and relatively inexpensive pump technology during the 1920s marked the end of the search for artesian flows and underground rivers, and ushered in the era of groundwater mining. The city continued its eastward and northward growth, but residential communities and commercial developments also began appearing along the Santa Cruz River. Land was subdivided and residences were constructed adjacent to the river.

It was during these same years, that is the period directly after World War I, that Tucson became widely renowned--largely through its own promotional efforts--as a health and tourist resort. Guest houses, tent cities, and hospitals for "lungers", including World War I veterans and tuberculosis victims appeared. Dude ranches catered to city people eager for a Western experience. Automobiles made travel easier, and swamp coolers and air conditioners made the climate more bearable.

The advent of the Great Depression in the 1930s slowed development of the city's infrastructure, but finances were nevertheless found to expand the water supply to meet increasing demand. The city survived the Depression through the tourism industry it had developed during the
previous decade and through internal commercial arrangements (Bufkin, 1981). The first zoning ordinance was passed in 1930, indicating a nascent interest in controlling the ways in which land was being used.

By 1940, virtually all water used in the area was obtained from wells drilled into the underground aquifer. Exploitation of the Santa Cruz River for its water had come to an end. Although demand intensified during the 1940s, the city did not construct any new water facilities of any size during these years. Rather, it continued purchasing private water companies.

The World War II years stimulated water consumption, particularly in the areas of agricultural production (mainly cotton), and in municipal use, largely due to the increased military presence in the city. The presence of the Air Force was especially influential, drawing substantial aircraft manufacturing operations into the area during these years. All of the war related industries, including farming, mining, military, and aircraft manufacturing required workers, of course, and workers used water. Furthermore, the diffusion of innovations such as the swamp cooler and air conditioner contributed to increased water demands during these years.

The end of the war marked the beginning of a huge population explosion in many areas of the country, including Tucson. During these years, farm prices remained
high and military activity remained strong. Industrial development became a major factor in water demand and water pollution.

No control was exercised over growth in the greater Tucson area until 1949. The first county zoning plan was approved by referendum in 1953, at a time when two-thirds of the growth was occurring outside of the city limits. Many of the newly developed areas were annexed by the city from 1952 through 1960. During these years, Tucson expanded its city limits to encompass more than sixty-one square miles. A general land use plan was developed in 1960; a 1959 regional transportation study led to improvements in the street system in 1965. (Bufkin, 1981).

Groundwater concerns at the state level culminated in the Groundwater Act of 1954, which identified Tucson and Marana among the areas considered to be "critical groundwater basins" (Kupel, 1986). At this time also, intensive negotiations were undertaken by the State of Arizona to acquire a portion of Colorado River waters. Tucson was in line for a share of the water won, but it was not until 1968 that an agreement was finally hammered out whereby Arizona would be allowed to divert a portion of the flow.

One of the actions to have significant ramifications for the development of the city was the urban renewal undertaken from 1965 to 1972. At this time, the downtown
had deteriorated as businesses and commercial establishments had vacated the central business district. Added to these losses was the perceived blight of a large neighborhood of old adobe buildings, many of which were in less than optimal condition. In an attempt to make the central business district more attractive, and thereby lure businesses and shoppers back, plans were initiated to replace the old adobe barrios with a modern collection of businesses and convention facilities.

The first urban renewal project was proposed in 1957 to encompass 392 acres of some of the oldest parts of Tucson. This proposal was defeated in a 1962 voter referendum; however, a second proposal, designed to include over fifty acres in the area south of Congress Street, was approved and initiated in 1965. The project, when completed in 1972, included the Tucson Community Center, the La Placita office/shopping complex, new city police and fire facilities, and a hotel. Urban renewal failed to achieve the envisioned renaissance of the central business district, but it did provide a focus for later activities directed toward renovating the floodplain of the Santa Cruz River in the vicinity of Tucson.

It was during the early 1970s that interest in environmental issues was expressed in local politics. Reflecting the national trend toward preserving and protecting natural resources such as open space, native
flora and fauna, and water, a majority of the City Council members were "New Democrat" activists who favored controlled growth and were prepared to address tough issues such as water pricing policy. While earnest in their goals to achieve a better balance between growth and quality of life, these city council members found themselves ousted in a recall election that was demanded after they had approved significant increases in city water rates (Martin, Ingram, Laney and Griffin, 1984). The ouster of the activist Council members did not result in a return to lower water rates, but it did send a warning to other aspiring and active government officials that any attempts to interfere with land use plans for privately-owned property would be strongly challenged.

During these years public hearings designed to inform the public about a planned major system of limited access roads also stimulated a strong negative reaction among various members of the community who were interested in limiting growth. These activists particularly questioned the plan's underlying assumption: that accommodation of the population and projected land use was intrinsically desirable.

Through the process of attempting to develop a comprehensive land use plan, begun in 1972, and due to a court decision which rendered it illegal to deny building permits for new construction, growth limitation advocates
soon realized that controls over urban growth would not be attainable. At the same time, growth pressures continued, and low-cost peripheral land disappeared, setting the stage for interest in developing vacant parcels of inner city land. The floodplain of the Santa Cruz River comprised a substantial portion of just such undeveloped, and therefore available, land. Although ultimately unsuccessful in making any real progress toward controlling growth in the area, these activists did succeed in forming a network of like-minded people who could be mobilized to challenge undesirable development plans, promote preservation of open space, and work toward development of a linked system of trails and parks.

Associated with the intensification of development was increased concern at the federal, state and local levels over the costs associated with flood damages. Although calls for a flood insurance program began in 1949, the first funded flood insurance program, the National Flood Insurance Act, was not enacted until 1967. The act, which originally provided only for subsidies to private insurance companies, was subsequently amended to mandate mapping of flood hazard areas and to require that new buildings be elevated or flood-proofed and insured.

It was not until the 1973 Flood Insurance Act, however, that sufficient federal domination was exercised to force Tucson to effectively address its flood hazard
problem, which was increasing as development on local floodplains increased. This act required localities to have active flood regulations in order to be eligible for flood insurance, and required flood victims to purchase flood insurance against future disasters. In addition, Section 1362 of the law required the relocation of families away from persistent flood hazard (Popkin, in press). These requirements eventually made it necessary for Tucson develop zoning, floodplain regulation, and flood control rules and policies to deal with the risks of building in flood-prone areas such as those of the Santa Cruz River.

Although Tucson did not institute effective floodplain management until the 1980s, newspaper accounts published during the 1950s reveal that, at the local level, lawsuits over flood damage were a major source of concern, as were results of recent court rulings covering flood damage awards:

Other states do not regard flood hazards in this light. So why should Arizona, a semi-arid state, look upon floods as something for which municipal governments can be held responsible and made to pay for instead of a natural phenomenon? . . . The courts, in effect, have issued a blank check even to the negligent property owner who buys cheap land, lying in a run-off channel, and then incurs flood damages thereon. . . . Under the present law, as interpreted thus far by the Arizona Supreme Court, a municipality is faced with the fact that any citizen can purchase land cheaply because of its location in an area which is subject to flooding, and then build upon it with a full knowledge that when flood damage is sustained it will be charged against the municipality (Arizona Daily Star, August 11, 1955).
In 1958, flood damage and liability issues prompted the city and county to consider zoning law changes which would have restricted building on floodplain lands (Arizona Daily Star, August 7, 1958). Among the groups which were active in promoting zoning as a floodplain management tool was the League of Women Voters. The League suggested that a survey be conducted which would map the areas lying within one-quarter mile of water courses that were subject to flooding and announced to the County Planning and Zoning Commission that it favored zoning restrictions rather than dikes. Further, the League stated that there was no need for extensive development along the city's drainageways because the amount of land was small in relationship to the amount of undeveloped land still available elsewhere in the area. The League also protested the lifting of a moratorium which had been placed on floodplain development (Arizona Daily Star, August 26, 1958).

Lack of funds and the controversial nature of the issues involved prompted officials to delay consideration of the floodplain zoning issue until the following year (Arizona Daily Star, November 19, 1958). Illustrative of the builders' attitude toward restrictive floodplain zoning during the 1920 to 1974 period are remarks made by Robert Lusk, head of Lusk Development Corporation. According to Mr. Lusk, questions about destroying vegetation and about
creating park sites along the rivers had been raised. He considered the park idea to be a confiscation of land and branded the floodplain zoning question a "phony issue" (Arizona Daily Star, November 18, 1958).

The idea of having all new subdivisions dedicate drainageways for flood control was raised as early as 1959 by Herman L. Danforth, director of the Department of Public Works (Arizona Daily Star, August 28, 1959). Like floodplain zoning and management, however, this idea would not be fully implemented until massive flood control works were undertaken after the 1983 flood.

Land use suggestions that would later materialize as the Santa Cruz Linear Park Master Plan appeared as early as 1967. In that year a concept sketch plan called for the establishment of regional parks along the major water courses in order to promote development of low-density uses and open space on the floodplain. These parks, it was suggested, could be tied to flood control work then being contemplated by the Army Corps of Engineers (Pima County Planning Department, 1967).

An expanded concept plan for parks and open spaces, published in 1970, cited the need for flood control improvements and cleanup of the Santa Cruz River (Department of Community Development, 1970). In this plan, it was suggested that improvement of the Santa Cruz River would link several recreation areas and historical sites
together and would make the central business district/civic center area more inviting to residents and tourists. Picnicking, hiking, horseback riding and bicycle riding were among the recreational activities that could be accommodated by such a plan. The goal of the plan was to prevent indiscriminate development of floodplain land, reduce the flood hazard, and encourage development that could be integrated into a broader open space system.

The convergence of federal floodplain regulations, availability of substantial federal funding from a variety of sources, the need for bank protection to mitigate flood hazards, increased interest in open space and recreational opportunities, environmental preservation, and increasing concerns about safeguarding water quality led to a renewed interest in the Santa Cruz River in the mid-1970s. Floods in 1977 and 1983 provided the final impetus that was needed to embark on a massive program of channel stabilization, urban revitalization and park development that subsequently ensued.

Although the foregoing narrative reveals considerable interest in the Santa Cruz River, particularly in the areas of flood control and park development, the interest remained conceptual. Except for some engineering work to improve flood drainage within the urbanized area, and some channel modifications made in the Santa Cruz River near San Xavier, the riverine landscape displayed no tangible
evidence of commitment to realizing the concepts developed during the years from 1920 to 1974. In fact, as described below, interaction with the river and its floodplain during these years resulted in a series of decisions and actions which negated the identity of the area as a riverine environment, thus rendering the landscape invisible within the dominant social discourse.

The Landscape of the "Invisible" Period

A search for humanly authored landscape elements during this period produces little which can be considered as expressive of an awareness of the Santa Cruz arroyo as a riverine environment. As late as 1955, a set of aerial photographs reveals that agricultural fields were still in evidence near Sentinel Peak. However, encroachment on the floodplain by houses and other structures is also plainly evident, as is abandonment of formerly cultivated fields.

Intensive pumping, causing a drastic drop in the water table, eventually led to depauperation of the vegetation along the river. The last of the cottonwoods died, and the former agricultural fields were largely barren of vegetation by the 1960s. Mesquite trees dotted some of the former fields, but it was salt cedar, a phreatophyte with astounding powers of survival, which became one of the most prominent woody species growing
along the channel.

No longer needed for its water, and with agriculture having moved to the north and south, the Santa Cruz River was transformed into a derelict landscape. Landfills, wildcat dumps, sand and gravel quarries, clay pits, and sewage facilities appeared on the river banks adjacent to the city. The river, in fact, became the major repository for Tucson's waste. It became not only Tucson's back yard, but its alley and sewer. The entrenchment of the river opened up the floodplain to development, but what development occurred happened in disregard of the flood and erosional potential of the river (Betancourt, 1988; Zeller, 1989).

Hispanics, finding themselves increasingly marginalized in the Anglo culture, moved to the floodplain in increasing numbers. "In . . . barrios, Tucsonenses kept their Mexican roots alive. And in the more rural neighborhoods, especially those along the Santa Cruz River, Sonoran Tucson lived within sight of downtown office buildings" (Sheridan, 1986, p.244).

During the late 1930s, Hispanics began to move into the area just north of Sentinel Peak now known as Barrio Sin Nombre. The adobe homes they built, and their collection of chickens, goats and dairy cattle gave a flavor of rural Sonora, Mexico to the Tucson area (Sheridan, 1986). Two other barrios also developed along
the Santa Cruz River: Kroeger Lane and Menlo Park.

Kroeger Lane, a semirural barrio like Barrio Sin Nombre, was built on the east bank of the river, across from Sentinel Peak. The land had been cultivated by Mexican and Chinese farmers until the 1920s, when a flood damaged a nearby dam and spilled chemicals from a mining operation onto the fields. Anglo entrepreneur Michael Hayhurst bought the property in the 1920s and subdivided it into lots.

Menlo Park was a semirural collection of Anglo farms and residences early in the twentieth century. After World War II, the neighborhood came to be largely occupied by Hispanics.

The largest and most important of the Hispanic settlements which developed along the Santa Cruz River, however, is the area now known as El Rio neighborhood. The area had originally been designed for Anglos, but it was Hispanics from older barrios such as El Hoyo and La Convento who moved into the houses. "The street names may have represented some Anglo developer's vision of America [Niagara, Cherokee, Columbia], but the streets themselves belonged to Tucsonenses looking for a better life on the other side of the river" (Sheridan, 1986, p.244).

Originally subdivided as part of El Rio Park and Riverside Park, the Manzo neighborhood has also been largely occupied by Hispanics from the time of its
inception to the present day.

Among others who settled along the river during this period was John Talano, who purchased a four-acre ranch on the east bank of the Santa Cruz at Silver Lake, complete with tar paper shack, outhouse and water pump in 1927 for $750. During the ensuing years, Talano built a grocery store and gas station on his four acres and raised sweet potatoes, chiles, peanuts and watermelons, as well as rabbits and chickens, on the side. In a recent newspaper article, Talano remembered the Santa Cruz as a small stream, except when it flooded, when it presented a frightening spectacle as it spread to cover his bottom land. Financial woes during the Depression forced him to sell his property (Arizona Daily Star, July 19, 1989).

Flood control works, financed and constructed by the federal Works Projects Administration (WPA), were undertaken during the 1930s to eliminate some of the sharp meanders in the stream so that the land could be reclaimed for agriculture. Six channels were built across some of the more severe bends and revetments (constructed of hog wire fence or automobile frames) were installed to prevent further erosion. Trees were planted behind the jetties and revetments to protect heavy bends in the river. Trees were also planted along the river wherever it was deemed desirable to stabilize existing banks (Baker, 1935, cited in Betancourt, 1988). Entrenchment and bank protection
works such as those constructed by the WPA ensured that a well-defined channel would continue to run through the valley west of the city. However, flooding was not eliminated so much as it was displaced downstream toward the Marana area.

A flood in 1940 resulted in flows of sufficient erosive power to destroy the Crosscut system. In the wake of the flood, the major symbol of Tucson's quest for artesian flow was abandoned.

During the 1940s, Tucson disposed of its garbage by burning it in an incinerator on the east bank of the Santa Cruz River at Saint Mary's Road (Betancourt, 1988). The incinerator was closed in 1950, after which garbage was dumped in a number of landfills along the river. From 1953 to 1962 the main landfill was located at the base of Sentinel Peak, and extended from the remains of the San Agustin Mission site to the site where Warner's Lake had stood. In time, the landfill came to entirely fill the channel of the West Branch of the Santa Cruz along this stretch (Betancourt, 1989). A total of twenty-six landfills were identified in a 1987 investigation of the study area (CH2M Hill, 1987; Block and Merz, 1986). It is notable that landfills were operated at some of the most historic sites in Tucson's history: Congress Street, near the site where Silver Lake had stood, and near where the Rillito and Canada del Oro join the Santa Cruz.
Sand and gravel mines, as well as clay pits, proliferated along the river to meet the needs of the construction enterprises which sought to capitalize on Tucson's explosive growth. Once mined out, these pits became ideal sites for landfills, a common occurrence until the 1970s.

The landscape of the Santa Cruz River during the years 1920 until 1974 presents a picture of a channel constricted by landfill operations and dumping (including tons of construction materials involved in the building of Interstate 10), pockmarked by sand and gravel operations, and dotted by low-income residential areas, trailer parks, motels, commercial operations, and barren patches of ground. Some plots of land continued to be cultivated, notably the areas around Midvale Farms and the University of Arizona farm, but for the most part, agriculture had moved northward toward Marana.

Even though the Santa Cruz River presented a derelict face to the community and to travelers on the main north-south artery which lay between the city and the river, several phenomena, including two rather amazing works of Mexican folk art, belie the image of the river as being a completely neglected wasteland. The first, the Garden of Gethsemane, was built in 1946 by Felix Lucero, an itinerate sculptor who had moved to Tucson from Colorado seven years previously. In 1938, the year of his arrival in Tucson,
he had built a grouping of sculptures depicting the Last Supper and the Crucifixion on the east side of the river, but, he said, the Last Supper had been destroyed by vandals and the Crucifixion been washed away. Lucero stated in 1946 that he had observed over the years that he had lived in Tucson that the course of the floods were directed toward the east bank. Therefore, he was placing his new grouping on the west edge of the river.

Self-taught, Lucero said he built the sculptures, including a Crucifix, Last Supper, Entombed Christ, Holy Family, and a miniature scene of Christ before Pilate, in fulfillment of a vow he made as he lay dying on a World War I battlefield in France. The statues, which were cast in the bed of the river, were made of concrete in which heavy wire supports were embedded. After the completed statues were emplaced on the west bank of the river, Lucero dedicated the whole scene to Tucson. The garden has been, and continues to be, used for weddings, devotions, tourist visits, and the announcement of at least one political campaign (Griffith, 1988; Arizona Daily Star, January 13, 1946).

The second interesting encounter with artwork along the Santa Cruz occurred in 1924, when one Charlie Manier and his father stopped to explore the ruins of the old Butterfield Stage Station at Nine Mile Water Hole north of Tucson. The two men discovered an eighteen inch lead
cross, the inside of which was filled with writing, figures and designs. The discovery created quite a flurry of interest in the community and prompted further excavations. By early 1925, eight crosses, thirteen spears, nine swords, and a "weird monstrance" had been unearthed. The discoveries, and arguments about their age and authenticity, even made the New York Times. Finally, it was discovered that a young Mexican sculptor, who had lived quite near Nine Mile Water Hole, had been the owner of a small library of books that included classical language texts. This young sculptor had apparently incorporated the fruits of his historical and linguistic readings into his sculptures, which he then discarded at the site (Southwest Research Center, 1986).

The origins of the third provocative work of folk art which materialized on the banks of the Santa Cruz are shrouded in mystery. At some time during the 1970s, a crucifix built of scrap wood appeared on the site where San Agustín Mission had stood. A photograph of the crucifix reveals a number of candles at the base of the cross, indicating that the site was used as a place of prayer (Griffith, 1988). The crucifix is a powerful work of art and its removal by the early 1980s is a loss to the community.

Remains of the San Agustín Mission, which had experienced such extensive erosion, were reduced to a
portion of the south wall by 1937. In 1945, the first attempts to save the mission complex were begun. Concerned citizen and leading proponent of preservation, John F. Farson, wrote a letter to Arizona Senator Carl Hayden requesting that the National Park Service consider restoring the mission. Farson suggested that a desire existed to have the site included in a post-war project, because the city planned to beautify the area possibly with a park and with a highway along the Santa Cruz River. He included a sketch map with his letter to Hayden. The map depicted a highway and a historic park along the river (Hard and Doelle, 1978).

Farson was particularly concerned that as soon as the war was over, Mr. Steinfeld, the owner of the land on which the mission had stood, would start manufacturing bricks at his brickyard and destroy what was still left of the ruins. Unfortunately, no action was taken on his requests, and deterioration of the site continued. By 1949, the operations of the Tucson Pressed Brick Company had become a serious threat to the archaeological remains buried on the site. Because a valuable burial site was destroyed by the brick operation before officials were notified, a salvage operation was undertaken to recover whatever could still be found. Further salvage operations were undertaken in 1949 and in 1950, but inadequate record-keeping and inadequate archaeological work resulted in, at best, a very
fragmentary record of human history at the site (Hard and Doelle, 1978).

The city landfill operation in 1956 destroyed what remained of the mission and the two-story structure which were located on the eastern portion of the site. However, the City did stop operations long enough for an archaeologist from the Arizona State Museum, assisted by a crew of prisoners and volunteers, to map and record whatever architectural features could be uncovered. The value of the resulting maps was compromised, unfortunately, because the researcher failed to tie the features he mapped to a permanent datum on the landscape. Also unfortunately, due to lack of funds and storage space, artifacts recovered from the site were not thoroughly studied and some may have been discarded (Hard and Doelle, 1978).

In 1967, yet another study was made of the site in an effort to prove that the site was a fortified presidio. Such proof failed to be forthcoming, and interest declined until the mid-1970s when a sewer alignment threatened the less-damaged western portion of the historical site (Hard and Doelle, 1978).

### Structural and Landscape Analysis

Employing structuration theory and landscape as text methodology to the floodplain area of the Santa Cruz River
over the time period 1920 to 1974 reveals that a series of restructuration processes occurred, resulting in a significantly modified and redefined landscape. Interactions among institutions, agents, structures and the physical environment were most apparent in the landscape element categories of agriculture; Hispanic neighborhoods; extractive operations; landfills and wildcat dumps; flood control works; commercial development; and historical sites and art works.

The restructuring of agriculture from small farms to agribusiness, begun during the previous period, was completed during the years 1920 to 1974. World War II and the Korean War created a strong demand for cotton, the cultivation of which was supported by technological developments in water pumping, irrigation delivery systems, and automated harvesting equipment. The costs associated with these technologies fueled the institutional changes, including conversion to large-scale operations and big-business approaches to financing and management. The result of these changes was the consolidation of farm acreage in the hands of a few large operators who frequently concentrated on growing a single crop: cotton.

Spatially, the restructuring of agriculture was not only manifested in large areas single-cropped in cotton, but also in the movement of the center of agricultural production from the area adjacent to Tucson's city center
northward toward Marana, where vast tracts of uncultivated land overlay the large Tucson Basin aquifer. Cotton farming proved profitable during the war years, but were sustained after the war only by infusions of capital in the form of price support payments provided by the federal government. Such governmental intervention into the occupation of farming reveals the extent to which the cultural value of farming as an institution was prized, even though the actuality of farming in areas like the Tucson basin was far removed from the small-farmer images that underpinned popular support for the farm subsidy system. The irony of the price support system for cotton was that, in its role as a resource, it served to perpetuate and encourage the cultivation of a crop for which there was declining demand, a crop which demanded large quantities of groundwater—of which easily-accessible supplies were being rapidly depleted.

Within the immediate Tucson area, farm operations continued to exist mainly in the vicinity of Ajo Road and on several plots of ground owned by the University of Arizona. The presence of the University of Arizona farm plots along the Santa Cruz River is symbolic of the institutional involvement of academia and of the State in the promotion of agriculture, and of the role the University played as a resource in the development of commercial agriculture. Established as a State land grant
college, the University's involvement in agriculture dates back to its inception in the 1890s, when it was chartered, among other things, to provide academic instruction and support for agriculture and mining development in the State. Its participation in the restructuring of agriculture in the Tucson Basin included diffusion to farmers of new strains of plants, improved farming techniques, and promotion of the business of agriculture through research and development efforts in the field of agricultural economics.

The northward migration of agriculture created a vacuum on the Santa Cruz floodplain in central Tucson. This vacuum played an important role in the formation of ethnic residential patterns which persist to the present day. Although the rules which effected ethnic separation of Anglos from other residents of Tucson were not legitimated in formal law, they were nonetheless a powerful force in the distribution process. Wishing to maintain their customary lifestyles, and strongly oriented toward family cohesiveness, the Hispanics appropriated the area along the Santa Cruz River for their own. Of little apparent value to the dominant residential and commercial developers active in the eastern and northern portions of Tucson at the time, the land provided a location where residents could recreate and reproduce their Sonoran culture. By creating and maintaining their barrios along
the river, the Hispanics were able to reinforce and legitimate their history and cultural attachment to the area. As such, the landscape was both a relict of former times and a dynamic expression of the determination of the Hispanics to protect and nurture their cultural heritage. That the city limits were eventually extended to include these areas is an indication of the extent to which the barrios continued to be an institutional part of the city itself.

Further evidence of the extent to which awareness and appreciation of the riverine environment persisted and contributed to an alternative social construction of the landscape may be found in a study of anecdotes related by individuals who lived along the river. Residents who took part in the Mexican Heritage project in the early 1980s recounted their memories of the river. Alberto S. Urias recalled that the Santa Cruz ran with water when he was young, and described groves of willows and huge cottonwoods growing along the banks.

The trees were so lush that they arched over the river. People would go and hunt and fish along the river. . . . There were ducks and quail and doves and rabbits--and even fish. There were large rocks along the river and the women would go down to wash and gossip along the river. It was a sight to behold. . . . (Martin, 1983, p.49)

Urias remembered Carrillo Gardens as a beautiful garden full of trees and flowers, including different kinds
of roses from all over the world. The lake had a little
boat on it in which musicians would ride while they
serenaded picnickers. The great days of dancing and
celebration of holidays came to an abrupt end, however, in
1916 when a man dressed as the devil appeared in the dance
hall one night and frightened everyone away.

Elina Laos Sayre, born in 1902, remembered the Chinese
vegetable farms and reminisced about picnicking on these
farmlands along the river:

... there was lots of water and many trees. We
would lay our picnic out right along the banks of the
river. We would play the guitar and sing (Martin,
1983, p.54).

Margarita Martinez recalled what life was like along
the Santa Cruz after the turn of the century:

We had a milpa there [on Melwood Street]—not far from
the river, and we used to plant with the will of God.
When the season for planting was over, my husband
would go and work in the dairy... We would plant
beans and corn and squash and watermelon. (Martin,

Folk tales and legends also serve a valuable role in
revealing the ways in which a culture views its
surroundings and thus validates its cultural experience.
Margarita Martinez alluded to an old legend which seems to
follow Hispanics wherever they go: the legend of La
Llorona, the weeping woman who appears in white after dark,
often next to a body of water, searching for her lost
According to Margarita Martinez and others, La Llorona has appeared along the Santa Cruz River (Martin, 1983; Griffith, 1988).

Such stories are not limited to the Mexicans along the river, however. A popular Anglo tale tells of the sand trout, which, when the river went dry, developed lungs and eyes on stalks so that it could navigate through the sand of the riverbed (Griffith, 1986). Validation of dry rivers crops up in another tradition, that of referring to the day the temperature first reaches 100 degrees as the day the ice breaks on the Santa Cruz (Griffith, 1989). (See, for example, Arizona Daily Star, June 8, 1976). As demonstrated by the Anglo stories in particular, dry rivers continue to be recognized at least at some minimal level of cultural experience, but seem to be viewed with a kind of tongue-in-cheek irony. While not always specific to the Santa Cruz River, such stories illustrate the ways in which similar areas have been viewed and defined by members of the community.

As indicated above, the social process which led to the deterioration of the riverine environment also encompassed episodes of more positive interactions with the landscape. In terms of tangible manifestations of alternative constructions of the landscape, the Garden of Gethsemane and the cross on the San Agustin Mission site warrant consideration.
Lucero's Garden of Gethsemane communicates an expression of faith, a symbol of that determination to survive--and prosper--which has characterized the barrio communities along the Santa Cruz. Likewise, the appearance of the cross on the site of the San Agustin Mission, and its obvious devotional use, exemplify the continued social process of iconographic redefinition of the environment which has occurred simultaneously with the degradation of that same environment. Whether the appearance of such works of art represent a contradiction to the general invisibility of the river during this time period is debatable. Although the works appeared well within the floodplain boundaries, neither directly expresses any association with water, rivers, or fluvial processes. In the absence of the creators of the art, any conclusions on this point can be no more than conjectural.

With respect to processes occurring within the dominant social framework, the one area in which the river retained any degree of visibility within the social process was that of flooding and flood control. Although no major floods occurred between 1920 and 1974, flood damage did occur. The occurrence of such events reminded citizens that their control over the river was less than complete, but it was only through the regulatory and engineering activity on the part of the federal government that major changes occurred. It is significant to note that
engineering works accomplished along the river by the WPA and the U.S. Army Corps of Engineers were not manifestations of a restructuring of the social framework so much as they were reinforcements of the existing one. Projects to straighten the water course and to install bank protection works reaffirmed the river's social definition as an entrenched conduit for urban drainage and for flood flow conveyance. Furthermore, these activities, by containing the river within an engineered channel, served to remove perceived risks associated with floodplain development.

Perhaps the most significant manifestation of the area's growth and urbanization during the years 1920 to 1974 was the development of extractive operations, including sand and gravel quarries and clay pits. The sand, gravel, and clay extracted from the bed and floodplain of the Santa Cruz River were valuable raw materials for the construction of the buildings and roads demanded by the growing numbers of in-migrants, military facilities, and commercial and industrial operations. The structuration processes associated with this growth and development involved interactions among many institutional entities and agents responsible for construction, including federal and state highway authorities; financial institutions; builders, promoters and speculators; agents and representatives of local government; and the in-
migrants themselves who purchased the offered properties, items, and services. These institutions and agents saw the Santa Cruz River and its floodplain not as a source of water or land, but as a source of building materials and as a conveniently flat and level transportation corridor. The redefinition of the river, which had been begun in the previous era, was thus completed during the years 1920 to 1974 by the dominant forces active in Tucson's urbanization process.

The use of abandoned quarries as landfills exemplifies one of the ways in which the social processes of urbanization were manifested on the Santa Cruz landscape. With development proceeding toward the east and north, and with a large influx of people possessing no cultural association with the history of the riverine environment—nor with the Hispanics who were the primary keepers of that memory—the landscape lapsed into invisibility. Having thus disappeared from the social discourse, there was no significant opposition to the use of the Santa Cruz and its quarries for the disposal of overburden from highway construction, solid wastes, and sewage. Officially sanctioned landfills, dumpsites, and sewage facilities sprang up alongside wildcat dumps, leading to a constriction of the riverbed in some places, and to the recreation of a flowing stream northward of the Roger Road sewage facility.
The lack of rules regarding the location and management of dump sites, the lack of control over wildcat dumping, the types of wastes dumped into those dumps, and the lack of stringent requirements regarding the treatment of wastes, reveal the extent of ignorance regarding the consequences of such activities. The structuration process associated with the redefinition of the Santa Cruz River landscape was played out in a context of institutional ignorance of the role played by the fluvial regime of the river and of the hydrologic interactions between surface water and groundwater. The result was decisions and actions which would later be identified as hazardous to the health and well-being of the community.

New developments along the Santa Cruz River included motels, trailer parks, and other commercial establishments. These landscape elements, built to take advantage of people's increased mobility, were symbolic of the attraction the Tucson area had to those seeking recreation or retirement in a warm, sunny climate. Agents such as the Sunshine Climate Club were active in creating and legitimating this role for Tucson and were instrumental in attracting tourists, retirees, and other residents to the area. It is interesting to note that, although such businesses were located along the banks of the river, no recognition was taken of the river itself, even in the business's names. No efforts were made to create an
aesthetically pleasing environment for travelers staying in the motels and trailer parks. Furthermore, although the major north-south and east-west roads followed the course of the Santa Cruz River through the city, no efforts were made to present a pleasing aspect to motorists passing through. The social processes which accomplished urban growth and development did not include purposive interaction with the riverine environment. This omission, in turn, further reinforced the institutional invisibility of the river during this time period.

If further proof is needed of the invisibility of the river on the part of the dominant agents and institutions in Tucson during the period 1920 to 1974, evidence is readily at hand through an examination of the treatment of the San Agustin Mission ruins. Analysis of the events surrounding the Mission during this time period reveals that the conflict which arose between Farson, who wanted to preserve the ruins as an expression of the area's history and Steinfeld whose basic goal was profit from growth and development through the production of bricks, symbolized the extent to which cultural amnesia had set in regarding the value of the ruins as a symbol of Tucson's multi-ethnic history. The conflict also revealed the extent to which Anglo ideals about the individualistic rights of property owners to use their property freely overshadowed communal values associated with cultural
heritage and preservation, especially when the phenomenon being preserved represented a culture other than the dominant Anglo one.

The structuration process associated with the stimulation and accommodation of large Anglo in-migrant flows revolved around the control, development, and marketing of land and associated physical structures. The accumulation of capital from such transactions dominated the dialogue and activities of the era to such an extent that little power could be amassed to promote negotiations aimed at preserving artifacts symbolic of Tucson's cultural and historical heritage. In light of the intensive efforts undertaken to promote tourism during this era, it becomes clear that the Anglo society most valued, and worked hardest to promote, those attributes associated with a pursuit of sun and sport, rather than those which celebrated cultural and historical experience.

Although engineering works were undertaken to reinforce certain areas of the river, many other areas remained unprotected. Efforts to enact zoning laws to restrict floodplain development were made, but these attempts to restructure the system were largely unsuccessful. Dominance continued to be held by pro-development forces which fought, as institutions and as individual agents, any perceived threat to the legitimacy of their claims to develop the land unencumbered by
governmental or bureaucratic interference.

The way in which the river was defined, and thus managed, reflected institutional preconceptions regarding the nature of fluvial regimes. These preconceptions, and the resultant decisions and actions, were based on theories and studies of rivers formulated by academics and engineers working in more humid areas. In essence, the "real" river was rendered invisible by social processes which determined what the community perceived the river to be. Lack of knowledge about the very different desert stream processes, combined with a growing tendency for social processes to ignore the realities of the physical environment, culminated in heavy flood losses during subsequent years.

Summary

The years 1920 to 1974 were characterized by increasingly sophisticated technologies, including deep draft pumps, air conditioners and swamp coolers, and automobiles. The introduction of these technologies to the Tucson Basin, combined with an increase in population and in urban development, initiated a social restructuration process which resulted in significant changes in the character of the area. From a small village, Tucson grew into a modern city, with all of the political, cultural, and physical changes such a
transformation embodied. During this era, intensified agricultural activity (especially in the cultivation of cotton), the growth of tourism and health as major industries, and increased military presence all contributed to the changing essence and role of the city. These developments, in turn, initiated a social restructuration process which not only involved intensified the pressure on existing water sources, but also stimulated the development of new sources. Furthermore, the quest for water to support urban development resulted in the creation of a market for water companies. This market surfaced as a factor in water resource allocation tool after 1929, when the city began to turn from developing new sources to purchasing existing water companies in a bid to increase its deliverable supplies.

The two World Wars stimulated both agricultural and military activity in the area; on the other hand, the Great Depression added another cycle to Tucson's boom-and-bust history. The post-World War II years were particularly distinctive for the migration of large numbers of people into the area, stimulating a real estate and construction boom which resulted, among other things, in considerable development of sand and gravel operations within the beds of area streams, notably the Santa Cruz River. Increased population also generated increased sewage and garbage, leading to the use of large areas of the Santa Cruz and its
floodplain as a sewer and a dump. Such activities reveal the extent to which the river lapsed into textual insignificance during this period.

Interest was exhibited in finding solutions to flood hazards, and in creating a park along the river, but little activity occurred which displayed an interest in preserving the Santa Cruz as a specifically riverine environment. Although an effort was made to control floodplain development through zoning policy, pressure from developers, especially those who perceived that their financial prospects would be diminished as a result of restrictive zonings of their land, resulted in a strong trend toward relying on engineering solutions to solve flood hazard problems. A lack of major flood events during these years contributed to the slowness with which flood protection measures were actually developed and initiated. The lack of major flooding also created a false sense of security which would be seriously challenged in the flood events of 1977 and 1983.

A review of documentation from the 1920s to 1974 reveals few elements connecting individuals with the landscape. Sand and gravel quarries, landfills, wildcat dumps, and abandoned land dominated the landscape. A textual reading of these elements reveals a silence in the social discourse. Such silence may be interpreted as a lack of acknowledgement within the dominant social
framework of the river as an integral component of the community.

The few elements displaying some connection of individuals with the landscape which did appear during this timespan were associated primarily with the Hispanic community which, having been marginalized within the Anglo culture, made homes for themselves on the floodplain near downtown Tucson. These landscape elements, and supporting anecdotal accounts of the area, reveal a people struggling to maintain their lifestyle and culture in the face of increasing pressure from the dominant Anglo society. The extent to which they were able to create an alternative definition of the riverine landscape may be interpreted as a measure of the extent to which they were successful in resisting Anglo dominance of their culture.

In general, however, an observer of the landscape during the period from 1920 to 1974 would have seen a steady disappearance of the elements which gave the area visibility. The riparian vegetation died as the water table sank; the remaining vestiges of surface flow disappeared; and the landscape elements of previous eras, such as San Agustin Mission, relapsed into the earth from which they arose—or were buried under tons of refuse tossed over the city's back fence. The social processes of the era resulted in a river and its floodplain which were, for all but a few people, invisible.
CHAPTER 7
THE LANDSCAPE AND ITS CONTEXT: 1974-1989

The period since 1973 has been characterized by continuing population growth. Although net in-migration began to slow in the 1980s, the Tucson area has continued to post yearly gains in population (Plane, 1986). Trends begun in previous decades toward greater urban concentrations at the expense of rural lifestyles have been echoed in Tucson as government, commerce, industry, and tourism have continued to overtake agriculture in terms of financial importance to the area.

Like other areas of the United States, Tucson found itself in the 1960s and 1970s with a moribund central business district. Urban renewal changed the character of the area south of Congress Street from a network of adobe barrios to a complex of modern offices and convention facilities. But renewed vitality still eluded the district. The availability of federal funds, pressures to manage the city's floodplains, and a continuing desire to recapture the downtown area's former vitality led officials to consider how ideas for cleaning up the Santa Cruz River and establishing a linear park along fourteen miles of its course could be meshed with visions of a revitalized central business district.

In terms of the physical environment, after a
relatively dry period from 1915 to 1960 when no floods of over 12,000 cfs occurred, six events between 1960 and 1984 exceeded that volume (Baker, 1984). Increasing urbanization, as well as increasing urban encroachment on the floodplains of the area's streams and arroyos, contributed to higher flood peaks due to the increased runoff produced by these activities. The flood events resulted in heavy property and monetary losses and caused extensive erosion to the river banks. A review of the history of floodplain regulation is revealing of how social processes at various governmental levels played a role in the evolution of the Santa Cruz River as a landscape.

In the 1960s, the costs of flood damage throughout the nation became an important topic at the federal level, resulting in more stringent rules and conditions for receiving disaster relief. The National Flood Insurance Act of 1968 made flood insurance available to residents of those communities which agreed to manage their floodplains. The Flood Disaster Protection Act of 1973 made all communities which were not participating in the National Flood Insurance Program ineligible for federal disaster relief and required lenders who were federally ensured to require borrowers seeking loans for floodplain properties to purchase flood insurance. Executive Order 11988, signed by the President in 1977, required all federal agencies who were expending federal funds to engage in floodplain
management.

The state of Arizona echoed federal regulations in its own state-level statutes. Arizona House Bill 2010 (ARS 45-2346), passed in 1973, required the governing body of each city, town, and county to adopt floodplain regulations and to specify floodplain boundaries. In 1977, the Governor of Arizona signed Executive Order 77-6 requiring all State agencies to practice floodplain management in the expenditure of State funds (Martinez, 1986).

At the local level, authorities worked to enact floodplain ordinances and to delineate lands subject to inundation by a federally-defined 100-year flood. Pima County succeeded in adopting a floodplain ordinance in 1974, but did not enter the National Flood Insurance Program until 1984. The City of Tucson did not succeed in passing a floodplain ordinance until 1982 (Ordinance No. 5526). During the same year, upon completion of its Flood Insurance Rate Maps, the City entered the Regular National Flood Insurance Program (Pearthree and Baker, 1987).

Flood hazard boundary maps of Pima County were issued effective October 23, 1977. These maps included the approximate 100-year flood boundaries for all major and minor watercourses in the area, including the Santa Cruz River. The first Flood Boundary and Floodway Maps and the Flood Insurance Rate Maps were issued in 1981 and revised maps were adopted by the county in 1983. Also in 1983, the
county adopted Revised Flood Plain Management Ordinance (No. 1983-FC1) (Smutzer, 1983).

During this same time period, increasingly sophisticated knowledge about the hydrology of rivers in arid and semi-arid areas led to adjustments in the ways in which floodplain boundaries were calculated and mapped. The bureaucratic definition of floodplain boundaries based on these calculations aroused challenges from landowners whose property suffered real or perceived devaluation based on the floodplain boundaries, leading to greater pressure to stabilize stream banks and thus remove the property from the floodplain. Among the rules adversely affecting some landowners were federal prohibitions on the construction of permanent structures within the defined floodway. According to federal definition, the floodway included not only the stream channel, but also adjacent areas required to convey flood waters. No construction which would increase flood levels by more than one foot was allowed within the floodway. Development was allowed on the floodway fringe (land outside the floodway subject to a 100-year flood), according to federal rules, so long as the basements or finished floors are elevated to at least the 100-year flood level.

Within the general framework prescribed by federal rules, local governments are free to regulate land use as they see fit. The landscape of the Santa Cruz River
reflects both federal and local rules, as local officials have restricted development in designated floodways to "non-permanent" structures such as sand and gravel operations, golf courses, parking areas, agriculture, and open space recreation areas. Within the floodway fringe, provided the development does not increase the elevation of the 100-year flood by more than 0.1 foot, the city allows structures to be built. However, the basements or first floors of the structures must be built at least one foot above the 100-year flood level (Pearthree and Baker, 1987).

Although questions about the methods used to estimate flooding were already being raised in 1976 (Reich, 1976) it was not until after the flood of October 1983 that individuals familiar with the regimes of desert hydrology mounted a major attack on the methods used by federal agents responsible for floodplain regulation. A series of studies sought to demonstrate that calculations used to delineate floodplain boundaries for streams in more humid regions were inappropriate to the hydrologic regimes of desert streamways (Fonseca, 1983; Reich, 1984a, 1984b, 1985a, 1985b).

The results of this research, as well as intensive studies of the Santa Cruz to discover how channel changes actually occurred (Hays, 1984; Baker, 1984; Pearthree and Baker, 1987; Betancourt and Turner, 1988, Betancourt, 1988)
have resulted in changes in the ways in which flood control works are to be carried out. Maximum flood levels to accommodate flows generated during a 100-year flood have been increased, and engineering designs have taken into greater consideration the varying conditions along different stretches of the river. These changes have had significant implications for the landscape of the Santa Cruz River.

Current plans call for bank stabilization all the way from the boundary of the San Xavier Reservation to just beyond the Pima-Pinal County line (Simons and Li, 1986a, 1986b; CMC Drainage Engineers, 1988). Gone are the ideas incorporated into the 1977 Santa Cruz Riverpark Master Plan for use of natural vegetation to stabilize banks and enhance recharge. Gone also are the plans to utilize floodplain zoning ordinances as the major way to control floodplain land use. The restrictions on floodway and flood fringe land uses are still in effect; however, the effect of channelization works has been to remove from floodway and flood fringe designations much of the land which had been so designated.

Many other studies have also focused on the Santa Cruz River and its floodplain. Extensive water quality surveys (conducted by the Pima Association of Governments), studies on ways to capture runoff so as to improve recharge to the aquifer, and research on alternatives for how to bring
Central Arizona Project water into the city have focused on the river as a repository for water. For example, among the alternatives considered for CAP water was the use of the Santa Cruz River channel as a conduit. Such a plan would have taken advantage of an already-developed channel and would have restored water to the reach near downtown.

It was soon realized, however, that using the Santa Cruz River for enhanced groundwater recharge or for CAP water conveyance was fraught with difficulties. Years of indiscriminant dumping had introduced dangerous substances into the river. Furthermore, any addition of water to the river would raise the water table to near the surface, thus making the river less able to convey large flows through the city without flooding. As has so often been the case with the Santa Cruz River, actions taken in the past have circumscribed the current array of options for dealing with the river. The plan reveals that water continues to play an important role in the value system of the community with regard to the riverine environment; however, the value placed on that water remains lower than the costs involved in reintroducing it into the landscape.

The environmental movement which had begun in the 1960s, and which had produced the National Environmental Protection Act of 1969, prompted concern about the quality of the natural environment. Of the laws passed by the federal government, the Water Quality Act of 1974 had the
most direct influence on the development of linear parks in Tucson. Section 404 of this act requires mitigation of any habitat destroyed through activities occurring on navigable streams or on tributaries to navigable streams. A study completed in 1987 concluded that the Santa Cruz River had never been a navigable stream (Holub and Bufkin, 1987). However, as a tributary of the Gila and Colorado Rivers, the Santa Cruz River falls into this category, and therefore is subject to regulation in regard to water quality standards and habitat maintenance or mitigation requirements. Decisions to go ahead with development of linear parks along Tucson's major watercourses was the city's and county's response to this requirement (Huckleberry, 1989).

At the state level, the Groundwater Management Act of 1980 initiated intensified efforts to manage all water resources within designated critical basins. The Tucson Active Management Area (TAMA), one of four critical basins designated throughout the state, has been highly active in developing plans to utilize all water resources in the area, including groundwater, storm runoff, effluent, and Central Arizona Project water (projected to bring Colorado River water to the Tucson area beginning in 1991).

In terms of its effect on the floodplain of the Santa Cruz River, TAMA's role in finding uses for effluent water, much of which is processed by the Roger Road treatment
facility and discharged into the Santa Cruz River at Camino del Cerro, has been particularly notable. Although heavy diversions of effluent have not yet begun, future TAMA plans call for redirection of much of this water, which feeds dense vegetation growth north of the discharge point, to other uses such as irrigating turf areas. If enough of the water were to be diverted, the downstream riparian vegetation could be destroyed, thus initiating a significant visible change in the riverine landscape.

Department rules limiting the planting of "high water use" vegetation (such as turf) have also influenced the design of the landscape of the Santa Cruz Riverpark. Turf areas have been restricted to specified areas, while the remainder of the park lands have been landscaped with desert-adapted species.

By actively pursuing a policy of retiring agricultural land so that the water can be put to higher uses, TAMA has encouraged the abandonment of the oldest and most continuous (albeit a relict) land use along the river. The disappearance of agriculture from the floodplain, in turn, reveals the extent to which a metamorphosis in the economic, political, and social processes of the community has occurred.

The development of plans and proposals for establishment of parks, preservation of historic sites, revitalization of inner city neighborhoods, and general
beautification of the landscape took place within the context of growing awareness and concern for the physical environment and its various components. The passage of the National Environmental Policy Act of 1969 (NEPA) was an early reflection of these trends. It set the stage for the concrete changes which ensued by providing legitimation for the concepts of environmental conservation and preservation. The availability of a wide range of federal funds, together with a general movement toward recreational activity, concern for environmental issues and individual health and well-being, and rediscovery of local history and identity, prompted a series of activities aimed at reclaiming the Santa Cruz River and whatever of its floodplain that could be salvaged.

Cleanup of the dumps along the Santa Cruz River began in 1974 (*Arizona Daily Star*, May 6, 1974). The linear park plan itself first surfaced as a funded project in August of 1975, with the acquisition of funds from the Bureau of Outdoor Recreation, matched by the City Parks and Recreation Department. An important benefit of the park mentioned at the time was a softening of the cultural barriers between the predominantly Mexican-American west side and the Anglo east side (*Arizona Daily Star*, August 18, 1975).

Guy Greene first appears as a major player in the riverpark development effort in 1976 when he discussed with
the City Council the possibility of pumping effluent uphill from the Roger Road Treatment Plant to create a running stream in the portion of the river near the downtown area (Arizona Daily Star, February 16, 1976). In August of the same year, the project was seen as the focal point for massive downtown redevelopment, including houses, streamside apartments, small shops and parks (Arizona Daily Star, August 27, 1976).

Chief among the efforts to reclaim the Santa Cruz as a visible landscape was the Santa Cruz Riverpark Master Plan, published in 1977, and updated in 1982. The goals of the plans were subsequently reaffirmed in the Santa Cruz Area Plan (1984) and in the plans for the adjacent neighborhoods. The adoption of these plans reveals a significant shift in attitude toward the use of land and water as natural resources. The plans are also significant for the attention given to the interactions of land use, habitat preservation, water quality maintenance, and flood control. Far from the one-answer-fits-all engineering approach of earlier years, the plans for the Santa Cruz reflect a growing awareness that a multiplicity of factors must be taken into consideration if management of a riverine environment is to be truly effective.

In the 1977 Santa Cruz Riverpark Master Plan, city resources were seen to be restricted to general obligation bonds and revenue bonds, plus tax increment bonds, if
enabling legislation were to be passed. However, a wide
variety of federal funding sources, and state and federal
statutes, were identified as being pertinent to plans for
the riverpark. Among these were the:

National Historic Preservation Act of 1960: Section
106 of this statute requires federal agencies having direct
control of federal or federally licensed/assisted projects
to take into account the effects of the project on any
site, district or structure listed on the National Register
of Historic Places.

National Environmental Protection Act of 1969: Section
102 of this act requires federal agencies to assess
the impacts on the environment of projects with which they
are associated on the environment and to assist in
decision-making regarding such impacts. The act requires
the preparation of detailed environmental impact
statements.

Executive Order 11593, dated May 13, 1971, Protection
and Enhancement of the Cultural Environment: Federal
agencies are required under this statute to take a
leadership role in preservation of cultural resources and
to identify properties which might qualify for nomination
to the National Register.

Housing and Urban Development Act of 1970: This act
authorizes the Department of Housing and Urban Development
to spend funds for archaeological and historic
preservation, when such preservation is done as part of a comprehensive planning program.

**Arizona Antiquities Act of 1960:** The Director of the Arizona State Museum is required, under this act, to establish regulations for granting permits to organizations who wish to excavate on state-owned or state-controlled lands. Persons in charge of surveying, excavating, or construction on state, county or municipally owned or controlled lands are required to report to the Director of the Arizona State Museum any archaeological, paleontological or historic sites discovered. Such individuals are also required to take all possible preservation precautions.

**Neighborhood Preservation Funds:** These funds were available through the Department of Housing and Urban Development, through the Housing and Urban Development Act of 1974 for stabilization and revitalization of existing urban neighborhoods. Eligible activities included acquisition and clearance of structures that could not be feasibly repaired; relocation assistance; rehabilitation; and site improvements such as street paving, etc. Funding was also available for parks improvement, land acquisition for right-of-way and protection of historic sites, new housing, and supporting commercial activities. Furthermore, these funds could be used as the local matching share for park development funding obtained
through the Bureau of Outdoor Recreation.

**FHA Loans:** FHA insured mortgages were seen to play a key role in housing development along the riverpark area by providing direct and indirect subsidies for such development.

**Flood Protection Funds:** The Army Corps of Engineers was slated to be involved in the development of the riverpark through its Urban Studies Program, which included water-related studies. After completion of the study, the Corps could provide matching funds for flood control works, including channelization and bank stabilization and related recreational facilities. According to the Riverpark Master Plan, "The Corps will probably be the primary Federal fund source for project implementation and flood protection" (Greene, 1977, p.32).

**Land and Water Conservation Fund:** This fund, administered by the Department of Interior, Bureau of Outdoor Recreation through the State Parks Department was seen by Greene (1977), as the major source of funding for acquisition and development of open space. Eligible activities included picnic areas, inner city parks, tennis courts, bike trails, etc.

**Pittman-Robertson Program:** Part of the U.S. Fish and Wildlife Service, Department of the Interior, funds could be funneled through the State Department of Fish and Game for land acquisition, development, research and
coordination in the restoration and management of wildlife and to preserve and improve habitat.

**Highway Beautification Funds:** It was expected that grants might be obtained from the Federal Highway Administration, Department of Transportation. Funding was expected to be available in support of riverpark development, but not as a direct source of funding for the park itself.

**Urban Mass Transit Capital Grants:** Administered through the Urban Mass Transit Administration, these funds were suggested as a possible resource for developing mass transit between downtown and the central section of the riverpark.

**Federal Aid Highway Program Funds:** These funds were expected to be a major source for improving circulation within the riverpark.

**Historic Preservation Funds:** The National Park Service, Department of Interior, was seen as a source for grant money to undertake acquisition and preservation of historic property listed on the National Register of Historic Places.

Objections to the riverpark plan materialized in 1977, when some of the Mexican-Americans who had lived along the Santa Cruz for many years voiced concerns that their taxes would rise due to the planned redevelopment and park activities. Some were particularly concerned that they
would be forced to move out of their homes to make way for the project. With the residual bad feelings generated between the city and the Mexican-American community over the downtown urban renewal project (which had destroyed many of their homes), residents of the westside barrios were prepared to fight another project that threatened to destroy their way of life (Arizona Daily Star, January 23, 1977).

The same concerns arose again in April of the same year; Guy Greene denied that the plan called for moving any families, but admitted that new townhomes and commercial offices in the downtown area might cause their taxes to rise, thereby indirectly forcing people out of their homes. (Arizona Daily Star, April 25, 1977). August saw yet another round of complaints from the Mexican-Americans concerned about riverpark plans. In a Citizens Advisory Planning Committee meeting, individuals stated their resistance to being relocated. Although support for bank stabilization and general cleanup of the river was apparent, participants were skeptical about the park plan. A running stream of smelly sewage water was not desired near their residences (Arizona Daily Star, August 18, 1977).

As of August 26, 1977, seven or eight Mexican-Americans were still refusing to sell and Gene Reid, City Parks and Recreation Department Manager, admitted that the
park will hurt "a few" poor families. It would, on the other hand, "help many, many more people than it will hurt. It's so attractive that I think it will bring people to Tucson on that basis alone" (Arizona Daily Star, August 26, 1977).

Not all Mexican-Americans were dismayed by the park and urban revitalization plans, however. A group of Mexican-Americans announced that they wanted to create a 100-acre barrio along the river, including residential units and commercial units, the rents from which would be used to subsidize housing costs. The project was envisioned to be a traditional barrio and at the same time a prime tourist attraction. Financing, however, had not yet been lined up, and no plans were committed to paper (Arizona Daily Star, August 28, 1977).

Announcement of receipt of a $900,000 federal grant breathed new life into the riverpark project just at the moment when the newly elected City Council was exhibiting waning interest and the City Manager was about to give up on it (Arizona Daily Star, July 14, 1977). With the funding, the city proceeded with its plan to acquire land for the park and urban revitalization plans (Arizona Daily Star, August 26, 1977).

The Citizens Advisory Planning Committee approved the riverpark plan in November of 1977, with the strong recommendation that no one feel forced to move. At this
time, five homeowners had said they would not move (Arizona Daily Star, November 17, 1977). Two additional federal grants from the U.S. Bureau of Outdoor Recreation, which would be matched by Housing and Urban Development funds, were announced on November 30 (Arizona Daily Star, November 30, 1977).

The next April the Arizona Daily Star was commenting on the sad state of the river, saying that efforts to clean it up dated back to 1932. Few used the new ramadas and bike paths along the river, and fewer still knew they were there. "The Santa Cruz Riverpark is desirable, an idea whose time has come and gone with the political tides. Evidently it's not something we should rush into" (Arizona Daily Star, April 30, 1978).

The riverpark suffered a major setback in July of 1978 when voters turned down an $11 million bond issue offered by the Parks and Recreation Department and the U.S. Army Corps of Engineers decided that the riverpark would probably not become a Corps flood control project. The city had been holding back on park development until the Corps' urban study was completed, in hopes that the park would qualify as a major flood control project. In fact, the city's desire to develop the riverpark was the main reason for asking the Corps to do the urban study. Robert Reynolds, supervisor for the study, told the city it had more of a "beautification than a flood problem" on the
Santa Cruz River. According to Bill Mills of the City Manager's Office, land acquisition was to continue regardless of the Corps' decision (Arizona Daily Star, July 27, 1978).

Significant to the future development of the riverpark, although not apparent at the time, was the formation of the Pima County Flood Control District in June of 1978 (Arizona Daily Star, June 6, 1978). The district, mandated by state law, was to become the primary agency in the development of flood control structures and the associated linear park, particularly after the 1983 flood.

The year 1979 saw the birth of the Downtown Development Corporation (DDC) and the development of plans for the Rio Nuevo urban revitalization project (Arizona Daily Star, January 14, 1979). The DDC, working with funds received through Community Block Grants, undertook in the following years to develop the strip of linear park from Saint Mary's Road to Mission Lane as part of its housing and commercial development activities. Essentially, DDC was responsible for developing the infrastructure and for finding private developers to actually build the structures. All development, however, was to be effected within DDC guidelines (McCoskey, 1989).

The portion of the riverpark developed by the DDC was innovative in its use of a terraced approach to flood control works. The lower portion of the channel was
stabilized with soil cement to accommodate a 50-year flood, while the upper terrace, stepped back from the lower and covered with grass and trees, was designed to accommodate the 100-year flood. The park was barely in place when the devastating floods of October, 1983 struck. The park sustained considerable damage, but did prevent adjacent areas from being flooded.

Damage elsewhere along Tucson's major watercourses, however, prompted flood control engineers and government officials to look to even more engineered stabilization works to avert future flood disasters. Studies made after the 1983 flood had discovered that soil cemented banks had withstood the flood reasonably well, but that increased damage occurred to areas just beyond the ends of the soil cemented areas. Therefore, it would be necessary to soil cement the banks along the entire reach of all the main watercourses (Baker, 1984; Pearthree and Baker, 1987). The result of these decisions was to make the landscape of the Santa Cruz River an engineered channel, with steep cemented walls from bottom to top.

Another important result of the 1983 flood was a bond issue, which was passed by voters within a year after the flood, to carry out the necessary bank protection works. As bank stabilization was completed, the linear park for that stretch was to be developed as well. Railings were to be placed at the top of the bank, to prevent accidental
falls. Escape routes were to be placed at regular intervals along the river's course to enable people and animals in the riverbed to gain access to the bank in case of flash flooding. The ramps also served as equestrian access points to the river channel.

Unfortunately, by the time the flood had occurred and the bonds approved, substantial development had occurred along stretches of the river slated in the 1977 Master Plan for open space and park areas. Among reasons cited for this development were decreasing availability of developable land close to Tucson; the oil embargo of the 1970s which led to concerns about future transportation options; and the great increase in land values throughout the area, for which park and open space proposals did not provide offsetting compensation (Zeller, 1989; Huckleberry, 1989). Recent plans have had to be modified to address not only the loss of potential open space to new industrial park development but also the possibility that a new classification of park users, that is, the workers in those business enterprises, would need to be addressed.

Of all the plans for reclamation of the Santa Cruz River as part of the community's heritage, only Silverbell Regional Park and Golf Course, portions of the pedestrian/bicycle path, and a pocket park just south of Grant Road, on the west bank of the river have been completed. As soil cement work has been completed
elsewhere, the bicycle/pedestrian paths and the access ramps to and from the river bed have been put in, but the area remains largely invisible to potential users. A special supplement to the *Arizona Daily Star* in August, 1989 did not even include the Santa Cruz Riverpark in its listing of bicycle/pedestrian paths within the Tucson area (*Arizona Daily Star*, August 18-19, 1989).

Plans are afoot, however, to install major components of the linear park system from Los Reales Road to at least Cortaro Road by 1995 (Huckleberry, 1989). The development of each phase of the park will occur in tandem with the completion of flood control works along that portion of the river. Park segments are also slated to be completed at some point for the stretch of river north of Camino del Cerro. Much of this area has been annexed by the Town of Marana in the last few years, including Continental Ranch, a new residential subdivision just north of Cortaro Road. Channel works along this stretch include a wide stream bed, currently filled with riparian vegetation which masks the bank protection works. Sewage effluent makes this stretch of the river quite scenic, but the future of this scenic beauty is somewhat in doubt. Not only is there a distinct possibility that the waters will be diverted for other purposes, but ongoing concerns also exist among residents of Marana about the degradation of their groundwater due to inadequately treated effluent.
Proponents believe that past experiences with the widely popular Rillito Riverpark, as well as with existing portions of the Santa Cruz Riverpark, will prove useful in making the Santa Cruz system even better than it would have been if it had been developed earlier (Huckleberry, 1989; Dixon, 1989).

The Re-Emergent Landscape

By 1974 the landscape of the Santa Cruz River was truly derelict. Aerial photographs reveal that even agricultural fields stopped before reaching the floodplain. Landfills, wildcat dumps, rusted auto bodies, and even abandoned vehicles, including a bus and at least one railroad car, littered the riverbed and the floodplain (Arizona Daily Star, January 23, 1977). Indicative of the extent to which the Santa Cruz gained in visibility is a comparison of the number of column inches devoted to the river during two sample periods. An examination of the Arizona Daily Star for the period from 1954 through 1959, revealed that eighty-eight column inches were devoted to topics related to the Santa Cruz River. Only twenty-five percent of this coverage was devoted to stories which were not about floods or flood control-related topics. This latter coverage included only two human interest stories, one about finding an anchor in
the riverbed, the other about some boys taking a boat ride on the river during a flow event. By contrast, 850 column inches were devoted to topics related to the Santa Cruz for the years 1974 through 1979. Of this coverage, nearly sixty percent was devoted to coverage of the Santa Cruz Riverpark and Rio Nuevo development. The rest of the coverage was related to weather and flood events, of which the flood of October, 1977 was a prominent subject. Clearly, according to this measure, the river was more visible during this time period.

Of the landscape features prominent in the earlier periods, cultivated fields can still be found near the northern and southern extents of the study reach and Solomon Warner's house remains on the landscape. The barrios also remain, and there were still a few horses and at least one burro in paddocks near some of the houses as of July, 1989. The Garden of Gethsemane is still a prominent landscape feature although, as part of the Rio Nuevo Project, the Downtown Development Corporation moved it up onto the riverbank, just above the bank stabilization works.

Houses, certain government facilities such as the Arizona School for the Deaf and Blind and the County correctional facility also exist on the river's banks, as do an assortment of commercial enterprises ranging from motels to auto salvage yards. The University of Arizona
continues to utilize its farm. The Roger Road wastewater treatment facility, and the Ina Road solid waste disposal plant dump thousands of gallons of treated effluent into the Santa Cruz River every day, feeding a lush stand of vegetation from Camino del Cerro northward beyond Tangerine Road. In some areas, such as north of Ajo Way, trash is still the major feature on the floodplain landscape.

The historically important landscape elements of previous eras, such as the San Agustin Mission ruins, Silver Lake, and Nine Mile Water Hole remain largely invisible, in spite of attempts to inject a historical perspective into floodplain management and park development plans.

New landscape elements, constructed since 1974, include soil cement bank protection works currently being built from Camino del Cerro south to Los Reales Road; the portion of the Santa Cruz Riverpark between Saint Mary's Road and Mission Lane which was constructed as part of the Rio Nuevo urban revitalization project; Silverbell Golf Course; and Silverbell Regional Park. Several new industrial parks, as well as some high density housing units, have been constructed along the river banks.

Except for the few miles of linear park constructed along the reach from Saint Mary's Road south to Mission Lane, however, few of these developments reflect any recognition the riverine environment they occupy. On the
other hand, the riverbed itself is undeniably cleaner in some areas, since crews have cleaned up the worst of the trash sites.

Perhaps the most direct interactions with the riverine environment are represented by the homeless shelters which occur under trees, behind bushes, and in culverts near the river (Arizona Republic, June 5, 1982). Some of the shelters are quite elaborate and reveal considerable resourcefulness in scavenging and utilizing the detritus that litters the river's banks and bed. Like the Indians who first inhabited the region, the inhabitants of these shelters are vulnerable to the vicissitudes of the river, but also have maximum flexibility in their ability to move or rebuild their abodes. Unlike the original inhabitants of the Santa Cruz floodplain, however, the residents of the shelters currently found along the Santa Cruz have no means of deriving a livelihood from their environment.

The re-emerging landscape of the Santa Cruz River is still essentially the conceptual landscape of the consultants, city officials, and citizens who formulated the 1977 and 1982 master plans. It takes a considerable amount of imagination to visualize how the river could look if the trash were cleaned up, land fill operations and dumping were stopped, and the land was revegetated and furnished with paths, easy access points, and structural expressions of past and present cultures.
The 1977 plan, as designed and assembled by landscape architect and consultant Guy S. Greene, was adopted by the City Council on February 13, 1978 (Betancourt, 1978b). The plan reviewed the physical and historical aspects of the river and its floodplain from Camino del Cerro on the north to Los Reales Road on the south and recommended a series of land use, flood control, groundwater recharge, and historic preservation measures which would re-establish the river as a valued asset to the community. Key to the 1977 plan was this multiplicity of purposes which the park was meant to serve.

In the 1977 plan, historic preservation, including designation of the area as a historic district, ranked high on the list of priorities for the riverpark. Such a designation was seen not only as being important to a recognition of Tucson's heritage, but also as a means of qualifying for federal funding. Although the past could not be reconstructed, contemporary interpretations could be designed as reminders of Tucson's heritage:

We cannot restore the crystal springs which so enchanted Manje, nor bring back the lush growth along a marshy stream wandering through grasslands. We can, however, suggest an ambient which is in keeping with the natural tradition of the Santa Cruz and which is practicable in contemporary Tucson. (Greene, 1977, p.1).

To this end, Mr. Greene requested an inventory of the historic and prehistoric sites occurring along the portions
of the Santa Cruz River slated to be included in the riverpark (Betancourt, 1978). The purpose of the inventory, among other things, was to locate, document and evaluate all visible archaeological remnants remaining in the proposed historic district and to make suggestions about the interpretation and development of the archaeological resources discovered for the education and enjoyment of the public.

Not surprisingly, the survey discovered that clay and gravel extraction, as well as vandalism, treasure hunting, pot hunting and agricultural activities, had destroyed all but traces of Tucson's cultural heritage. However, sixty-five sites were recorded, spanning 5500 years of human occupation. Sites singled out for discussion included Rabid Ruin (the remains of a Hohokam settlement near El Camino del Cerro); the San Agustin Mission complex; Warner's Mill complex; the Silver Lake resort complex; significant Hohokam sites from just north of Drexel Road to Valencia; and the abandoned Los Reales community near Los Reales Road (Betancourt, 1978a, 1978b).

Also identified in the survey as a major landscape feature was the mesquite-shaded West Branch of the Santa Cruz River. It is interesting to note that the West Branch was originally the main stem of the Santa Cruz River, until early engineering works diverted the flow permanently into the current channel. Whereas the new channel underwent
significant alteration as a result of a succession of land uses, flood control modifications, and other man-induced as well as natural impacts, the West Branch continued to function as a vestige of original fluvial system. In recent years, its riparian vegetation and natural channel have made it an area worthy of preservation for its wildlife habitat and recreational amenities.

Water management was another major element in the 1977 Master Plan. Concerns over depletion of groundwater resources, and increasing movement toward integrated management of all water resources in the basin prompted extended consideration of the ways in which the riverpark could be designed to increase recharge of storm runoff while still safeguarding against flooding. Use of effluent for irrigation purposes, and to create a one and one-half mile running stream through the downtown portion of the river, was seen as a way of using and recharging the effluent waters to the aquifer rather than allowing it to escape downstream.

To address these issues, structural bank stabilization works, such as soil cement, were proposed for areas where restricted channel size was apt to lead to flooding. Wherever channel modifications were to occur, however, "we cannot think in terms of absolute control [of flood flows], but rather of directing these forces as gracefully as possible" (Greene, 1977, p.6). In other areas, planting
of appropriate vegetation was recommended to not only control flood flows but also to filter contaminants from runoff flows and from treated effluent waters which were to be used for irrigation of park vegetation.

Land use recommendations focused on residential and commercial developments adjacent to the linear park areas. The park was to be vegetated largely with desert-type plants, both to minimize water use and to create a more "natural" environment. Reintroduction of the historic cottonwood (Populus fremonti) was also seen as possible. Grasses were to be planted in areas where they would act most effectively as a filter for waste water to be recharged to the aquifer. Effluent from the Roger Road Wastewater Treatment Plant was to be pumped upstream to irrigate this vegetation, as well as to fill the waterway to produce a running stream.

Housing was identified as a particularly appropriate use of vacant and under-used land in the riverpark system, and was seen as important to the role of the riverpark in promoting revitalization of the central business district and inner-city neighborhoods. A mixture of densities was recommended, with higher residential densities to occur in the area nearest downtown. Lower density housing, a golf course, and "horse and garden" properties were recommended for parcels in the vicinity of Ajo Way.

Light industrial use was recommended for the area
between Drexel and Irvington, largely because the area was directly under flight paths to Tucson International Airport. Toward the northern end of the plan area, an 86-acre site south of the Roger Road Treatment Plant was designated for future regional park development. The vacant land across the river, south of Silverbell Golf Course, was recommended for medium-density residential development.

The 1982 Santa Cruz Riverpark Master Plan Update addressed the results of this development, which was largely industrial rather than the relatively low-density residential land uses proposed in the 1977 plan. The result of the development which had occurred was that only narrow ribbons of land were available for park development along some stretches of the river. However, plans were still active for major interpretive centers at the foot of Sentinel Peak and near the archaeological ruins in the vicinity of Drexel and Irvington. A hang glider landing site was included for the area near Sentinel Peak as were plans for a reconstruction of Territorial Tucson, including rodeo museum, rodeo staging area, and carriage ride concession. Plans to extend the linear park all the way to San Xavier were dropped; Los Reales was seen as a more realistic end point. Equestrian centers were recommended for the northern and southern ends of the park, and bicycle and horse rental concessions were included in the plan.
An outdoor amphitheater capable of hosting major events was planned for the area near Drexel and Irvington. Finally, in yet another effort to link the riverpark with downtown, it was suggested that a "skypark" be constructed near the Congress Street crossing. Such a skypark would include a structure which would allow tourists to ascend and take in a panoramic view of Tucson (City of Tucson, 1982).

In reality, funding has only been available for those elements of the park which satisfy Section 404 of the Clean Water Act of 1974 and which provide recreational facilities. Vegetation, including desert-adapted trees and grasses have been planted and paths, picnic ramadas, and other recreational facilities are either in place or are planned for installation as bank stabilization proceeds.

The historic interpretation elements stressed by Guy Greene in the 1977 Riverpark Master Plan and echoed in the 1982 update to the master plan have remained on the drawing board, victims of inadequate funding and generalized lack of momentum to push for their development. The area was never placed on the National Register of Historic Places, and so the opportunity to draw on revenues and regulatory powers associated with the Historic Preservation Act was lost.

Renewed interest in development of features linked to the area's history may be forthcoming, however, due to expansion of the downtown Convention Center facilities.
The development of additional tourist attractions easily accessible from the Convention Center and downtown hotels has been seen as a drawing card for enticing conventions and meetings to the facilities (Dixon, 1989).

The Rio Nuevo project, begun in 1979, is still active, but has been slow in realizing its plans, largely due to a serious downturn in the economic climate of the city. The Downtown Development Corporation (DDC) has thus far developed 640 housing units within Rio Nuevo and has plans for another 300 units south of Congress Street. It had completed its bank stabilization works and had completed and dedicated to the city its portion of the Riverpark just before the 1983 flood occurred. Its plans for a themed destination site made up of retail import-export businesses, community cultural facilities, and restaurants has not yet materialized, but plans for a sculpture garden, to be installed along the river, are being actively pursued as part of a continuing effort to restore the river environment as much as possible.

In addition to physical improvements to the Rio Nuevo revitalization area, DDC has been active in working with local residents (particularly within the Hispanic community) and in communicating its activities to members of the larger community. Although greatest interest in the Riverpark and redevelopment activities occurred several years ago, questions raised at presentations given by DDC
indicate some residual interest in the project. DDC has also produced brochures, which are available at their office as well as being on display at motels along the river, describing the facilities available within the riverpark (McCoskey, 1989).

Aware that the area of the Santa Cruz River within the Rio Nuevo project area was one of the first sights travelers saw upon approaching the central portion of Tucson, city officials were concerned to provide a better first impression of the city (Murphy, 1989). Cleanup and development of that portion of the Riverpark improved appearances somewhat, but, after dedication to the city, the Rio Nuevo portion of the linear park deteriorated to some extent, due to lack of proper maintenance by the Parks and Recreation Department. Recently, the Parks and Recreation Department has increased its maintenance activities along the Santa Cruz River and has expressed commitment to keeping the park cleaned up, but long term commitment to maintaining the park will rest upon the degree to which the county is committed to doing its part (Dixon, 1989; Nichols, 1989).

Around 1987, it became increasingly obvious that jurisdictional conflicts between the city and county were going to make development and administration of the linear park system difficult. Negotiations were begun to delineate the responsibilities and areas of control
assigned to the city and the county. An intergovernmental agreement, expected to be approved by the end of the year, stipulates that the County will be responsible for developing its part of the linear park system and will also be responsible maintaining the fifty to two hundred foot wide strip of linear park throughout the system (while the city retains ownership of those portions of the land which it has acquired). The city will be responsible for developing and maintaining the rest of its property, including the nodal parks attached to the linear park system (Dixon, 1989; Nichols, 1989).

Perhaps the greatest hindrances to the timely development of the riverpark have been the drying up of funds, particularly at the federal level after the election of Ronald Reagan to the presidency, and the lack of will at the local levels to see the project through to completion. Of the two, lack of funding has been most critical. However, the short timespan of tenure of most members of the City Council and County Board of Supervisors contributes to the problem of dealing in short-term issues and immediate solutions, rather than long-term planning (Murphy, 1989; Zeller, 1989). Unwilling to risk voter disapproval, it is often easier for council and board members to ignore projects such as the Santa Cruz Riverpark plans than to act on them--especially if such action threatens landowners who are their constituents (Murphy,
The result of the rapid loss of momentum after the brief flurry of activity from the late 1970s through the early 1980s is visible on the Santa Cruz landscape today. The bicycle/pedestrian path stops and starts in segments too short to allow a rewarding excursion along the river. Promises of a renewed riverine landscape and revitalized inner city area remain just that—promises.

It has been five years since the Parks and Recreation Department has allocated any funds for development of the riverpark, and, although land acquisition activities have proceeded, since 1982 no park development has occurred along the Santa Cruz. A park development bond issue had been proposed for the 1984 election, but was killed by the Bond Committee before it could even be placed before the voters (Dixon, 1989). It remains to be seen whether the bond issue scheduled to be placed on the ballot in 1990 fares any better. In the meantime, development of the riverpark will be financed by flood control district funds. This means that whatever park development occurs will be done in the name of wildlife habitat mitigation. Other plans, such as historic site development, will not be included.
Structural and Landscape Analysis

Social process during the time period 1974 to 1989 is most clearly represented on the landscape in the large-scale flood control projects which have been initiated; development of the linear park along the river; and appearance of many more permanent structures adjacent to the river channel. Also significant as representations of social process are the prevalence of homeless shelters along the river's course and the continued existence of the Hispanic barrios.

The flood control works and the linear park are inextricably linked to each other, largely due to the manner in which funding for the park has been institutionally associated with federal requirements to mitigate the destruction of wildlife habitat occurring as a result of the construction of flood protection works. However, the social interactions which combined to produce both the flood control works and the linear park are much more complex than such a simplistic explanation would suggest.

Among the factors which have played a significant role in recent years in the changes which have occurred both in the physical appearance of the landscape and in the iconographic significance of the features which make up that landscape are, first of all, events occurring in the
physical environment. The damaging floods of 1977 and 1983 prompted a reassessment of the ways in which local institutions should interact with the riverine environment. Private ownership of floodplain land, including appurtenant portions of the riverbed itself, came into direct conflict with increased momentum toward restricting the types of land use activities allowable within delineated floodplain areas. The very act of institutionalizing the definition of the floodplain itself was a significant accomplishment, achieved only after considerable opposition from owners of land included within the defined floodplain boundaries. Certainly, federal pressure, in the form of denial of flood disaster assistance and floodplain insurance eligibility, was an important factor in bolstering the resolve of local city and county officials to persevere in their attempts to establish rules and procedures for the management of hazard-prone areas.

Also important in the movement toward redefinition of the appropriate uses of floodplain land were the heavy losses sustained in the 1977 and 1983 floods. Particularly the 1983 flood stimulated engineers, academic researchers, and local politicians and bureaucrats to examine the implications, as well as the effectiveness, of the piecemeal bank protection works which had been previously employed and of the calculations which they had used to define acceptable flood risk.
The use of the federally-designated one hundred year flood criteria were found to be inappropriate to the assessment of flood behavior in desert streams. Persistence on the part of individuals such as Brian Reich, as well as institutional involvement in the form of intensive studies carried out by researchers associated with the University of Arizona and the United States Geological Survey finally resulted in a reworking of the flood calculation method to more accurately reflect arid zone hydrology.

The outcome of the modification in the ways in which the behavior desert streams was explained, and consequently in the calculation methodology employed, was manifested in the interaction between the engineers, academic researchers, politicians and bureaucrats. This recursive interaction, in turn, legitimated the realization that bank protection works would have to be installed as a continuous structure throughout the entire urban stretch and beyond. Furthermore, legitimacy was accorded to the idea that the works would have to accommodate a larger flow than had been previously been designed for.

Early plans for the linear park called for a flood control design which included alternatives to strictly soil-cemented walls. The damage caused by the flood of 1983, however, prompted the engineers and decision-makers responsible for selecting and installing flood protection
works to eliminate all but soil cementing as an option. In this instance, an event in the physical environment (the 1983 flood), had a significant influence on the social structuration process which was in progress. This process, which involved the interaction of environmentalists, land owners, developers, bureaucrats, and politicians, was a movement toward redefining the river and its importance to the community.

A conjunction of events, and changes in social process at the national level, occurred at this time, as part of the structuration process. A strengthening of the environmental movement occurred, as did increased intervention on the part of the federal government in the social and political processes at the local level. Inner city land increased in value. A growth occurred in knowledge about the hydrologic connectivity of surface water and groundwater, and awareness increased of the need to conserve and protect local water supplies. Also important at this time were growing interest and group activism in historic preservation, and provision and utilization of recreational and leisure opportunities close to home.

The Arizona Departments of Environmental Quality and of Water Resources, the Pima County Department of Transportation and Flood Control District, the Downtown Development Corporation, the City of Tucson Parks and
Recreation Department, the Arizona State Museum, and the University of Arizona were prominent in the redefinition of the Santa Cruz River in response to the varied, and often conflicting, demands voiced by the many special interests involved. However, it was Guy Greene, a landscape architect with a strong personal vision of what the riverine environment could become, who synthesized the products of the interaction between institutions, individuals, and structural rules and resources into a redefinition of the river itself.

This synthesis took the form of the Santa Cruz Riverpark Master Plan (City of Tucson, 1977) from which much of the future activity and decision-making would be stem. Greene's plan incorporated flood control, historic preservation, neighborhood preservation, environmental conservation and enhancement, recreational and leisure opportunities, aesthetic appeal, downtown development support, archeological opportunities and recognition, and water augmentation/quality control features into a model of how the riverine environment could be modified to reflect the multi-faceted demands of an increasingly complex social formation.

Within structuration theory, all of these features can be seen as institutions which people, acting as individuals or groups, seek to initiate, reinforce or change through recursive interaction with the structural
components of rules and resources governing those institutions. In the case of the redefinition of the Santa Cruz River, federal, state and local laws and regulations, capital available particularly through federal programs, technological knowledge possessed by engineers and academic researchers, land acquired by the city and county, and local support for the program all played a role.

As events transpired over time, however, federal monies disappeared with the advent of the Reagan administration and local support diminished as it became clear that outside funding would not be available and as the floodplain land increased in value.

Had it not been for federal requirements associated with flood insurance, disaster relief, and habitat maintenance, and the availability of funds for works which address these requirements, it is doubtful that the improvement of the river and its floodplain would have progressed as far as it has. In particular, institutional definition of the Santa Cruz River as a tributary of a navigable stream enabled the use of federal funding of habitat mitigation to build the linear park.

The existence of the soil cement works, and of portions of the linear park, are symbolic of the extent to which intervention and participation of the federal government in local political and social processes has evolved. Such institutional intervention has played a
significant role not only in the social process, but also in the production of landscape features.

The outcome of the social restructuration process with regard to flood protection and park development has been an engineered, cemented channel which bears little resemblance to Greene's original concept. This channel, far from representing a willingness to tailor land use activities to the realities of the physical environment and fluvial regime, actually symbolizes the extent to which the dominant social forces were willing to go to reinforce customary practices legitimated through economic theory, market practices, and legal precedents associated with property rights. The installation of flood protection works, rather than producing an interactive landscape consisting of a buffer zone of plants, paths, and vegetation along the river, produced in many areas a landscape of industrial facilities, office parks, and residential developments. The resultant landscape allowed a redefinition of the bureaucratically defined floodplain boundaries and reinstated landowners' customary usage rights.

It is only in the efforts put forward by the Downtown Development Corporation in its Rio Nuevo development project that some echo of Greene's plan can be found. The portion of linear park developed as part of that project, and the general improvements that were carried out,
indicate that, when an issue as important to the community as revitalization of the downtown district is concerned, the will and resources may exist to achieve the goals expressed in that plan.

The absence of features associated with historical and cultural preservation is particularly noticeable on the landscape and reflects the continued unwillingness of the community to invest in representations of its past, or of its cultural diversity. The recursive relationships among the citizens of Tucson, local institutions, and availability of resources, especially adequate funding, have failed to produce cultural or historical elements on the landscape. Individual activities, such as archaeological surveys, have kept the memory of landscape features such as the San Agustin Mission and the larger Hohokam ruins alive, but full recognition of the human and natural history of the river remains unrealized in the greater social process.

As a representation of the ways in which destitute members of Tucson interact with the dominant society, its rules and resources, and its institutions, the homeless shelters found along the banks of the river provide a valuable iconographic record. The shelters which dot the riverine landscape reflect not only the extent to which the larger society is unable, unwilling, or unprepared to care for all its members, but also the tenaciousness of
individual homeless people in finding ways to survive in such a situation.

The current status of many riverbank areas as somewhere between derelict and reclaimed has created the type of land use void which has allowed the homeless to redefine and exploit for their own benefit. Far from the brittleness characteristic of land ownership and usage rules imposed by the dominant capitalistic society, the practices of the homeless reveal considerable flexibility in land usage patterns. Shelters are temporary, and built from whatever discarded materials can be found locally. Each is designed in a manner that communicates a strong desire for privacy. The shelters tend to be placed at some distance from each other, indicating possibly a lack of community among the inhabitants.

Tensions between the homeless and the dominant society are manifested in periodic efforts to remove homeless individuals from their dwelling places along the river; however, the absence of effective dominance over the land and its usage by the larger community enables the homeless to persist in their occupation of the riverbanks. Although they may never achieve legitimacy of their occupation due to plans for development of the linear park project, the homeless have thus far been quite effective in resisting the rules imposed upon them by the dominant community.

The Hispanic barrios along the Santa Cruz River
provide another source of resistance to the plans of the dominant society. Although plans for development along the river ostensibly recognized Mexican-American heritage, in actuality they were interpreted by barrio residents as a threat to their way of life. The conflict between the residents and city officials which threatened to undermine riverpark plans was an illustration of the extent to which the perceptions and goals of the dominant society failed to reflect the internally defined needs and wishes of the Hispanic community. Since the 1983 flood, which brought home the extent of the risk faced by residents of river area barrios, resistance has been muted. Recent interactions have been more oriented toward interacting with local institutions to ensure that park plans are carried out as promised and are in accord with residents' needs and preferences.

Summary

The years between 1974 and 1989 have been characterized by a social structuration process in which institutions and concerned residents interacted recursively with rules and resources to clean up and redefine the Santa Cruz River, construct efficient flood control measures, such as soil cementing of the banks, and develop a linear park. Increased interest in the river during this period
has hinged on the convergence of a variety of institutional and structural factors including increasingly stringent federal requirements for floodplain management, increased interest (at least rhetorical) in environmental preservation and enhancement, stronger interest in local history and preservation of symbols of that history, increased demand for recreational facilities, and general interest in creating or preserving areas of open space to counterbalance the increasing density of the urban area.

Interacting with, and contributing to, increased attention paid to the river were the major floods of 1977 and 1983. Institutional constraints and social as well as economic pressures dictated a strong reliance on engineered solutions to identified hazard problems; however, land use ordinances were also employed as a tool in the development of floodplain management strategies.

The 1977 Santa Cruz Riverpark Master Plan was an ambitious attempt to incorporate a multiplicity of concerns and goals, ranging from flood protection, enhancement of recharge, and preservation of water quality to plans for enhancing urban recreation opportunities, preserving open space and wildlife habitat, and recreating landscape features symbolic of Tucson's history. Application of social theory to the events of the period 1974 to 1989 reveals that attempts to realize these goals were only marginally successful, due to lack of funding, lack of
political will, and intensified development of the floodplain.

Since 1983, much activity has occurred in the areas of bank stabilization, integrated floodplain planning, and acquisition of land for a major network of linear parks and connector trails. Current plans call for completion of major segments of the linear park by 1995. However, unless additional funds are forthcoming, park development will not include any of the historical interpretation or other cultural elements envisioned in the Master Plans.

The effect of the various flood control and park development activities has been the re-emergence of the Santa Cruz River and its floodplain as a landscape which reflects direct human and institutional interaction with a riverine environment. Whether current activities represent a true return of the river to visibility, or whether the period is merely one of transition, is a question which cannot yet be answered. With adequate funding and political will to see current plans through to completion, the Santa Cruz River may yet become the open space, recreational, historical, and cultural setting envisioned in the 1977 and 1982 Santa Cruz Riverpark Master Plans. Without the infusion of such resources, the river's future development may well fall considerably short of the goals articulated in the 1977 and 1982 Riverpark Master Plans.
CHAPTER 8
CONCLUSIONS

This study compares four time periods (pre-1890, 1890 to 1920, 1920 to 1974, and 1974 to 1989) to discover the ways in which social process, physical process, and landscape change have interacted.

A study of major landscape elements along the Santa Cruz River reveals that the river was a functional part of the community prior to the entrenchment process which began around 1890. The value of the river was recognized within the community as long as residents had to rely on the stream and its associated springs for their water supply. Until the development of a deep arroyo throughout the study reach, agricultural fields, watered via a system of irrigation canals which paralleled the river, created a garden landscape in the midst of the desert. Expansion of agriculture was held back until the 1870s by the small size of the community, which was unable to bring a halt to Apache raiding on the settlement. Once sufficient troops were available to subdue the Indians, cultivated acreage in the valley increased rapidly.

The change from seasonal agricultural habitation practiced by the Indians to year-round occupation introduced by the Spaniards occurred in the context of a major restructuring of the social, political and economic
environments. This restructuring was expressed on the landscape through the appearance of permanent structures as well as new crops, livestock, expanded irrigation systems, and a pattern of landownership which redefined control over, access to, and allocation of, water resources.

The incorporation of southern Arizona into the United States, accomplished via the Gadsden Purchase following discovery of gold in California, also played a significant role in the development of the area. The arrival of Anglo entrepreneurs, first by horse and stagecoach, and later by railroad, changed the social structure of the community from one of cooperation based on a sharing of risk and resources, to one of individualistic enterprise and competition. In contrast to the Spaniards and Mexicans who brought with them aesthetics and expectations developed in arid regions, the Anglos brought customs and preferences based on the more humid regions from which they had emigrated.

The landscape of the settlement came to reflect the Anglo predilection for grass lawns, tree-lined streets, and parks patterned on models developed in England. These preferences led to ever increasing demands for water. The development of parks such as Carrillo's Gardens and Silver Lake, as well as the unrealized plans for a competing resort at Warner's Lake, occurred in response to residents'
growing affluence and interest in engaging in recreational pastimes. It was a reflection of residents' desire to create an oasis for themselves that these activities took place on the shores of lakes created by damming the flow of the river. The social processes revealed by such changes in the riverine landscape reflected the very different set of expectations, values, resources and institutions which the Anglos brought with them.

Transition from the subsistence economy which had prevailed throughout the Spanish and Mexican years to a cash economy based on regional commerce and import/export enterprises put even greater pressure on local water sources, thus leading to social tensions. To resolve these tensions, ever larger water diversion projects were undertaken. However, these projects were undertaken with little understanding of how the results would interact with a flow regime that alternated between intermittent, shallow flow and raging flash floods.

Further stress was placed upon the system as farming expanded and demand arose for crops requiring greater quantities of water. Conflicts intensified between those who controlled water rights by virtue of being first in time and owning the land to which those rights were appurtenant, and those who sought to develop new acreage downstream. Although the immediate result of the interaction between the people, institutions, rules and
resources was to reinforce the existing system, later events, such as the digging of Sam Hughes's ditch and subsequent entrenchment of the river, set in motion a major restructuration of the processes associated with water exploitation, land use, and social reproduction.

All of these factors, in turn, played a part in the evolution of residents' definition of, and interaction with, their river. Until the introduction of deep draft pump technology and abundant, cheap sources of fuel to operate those pumps, residents were compelled to recognize the critical role the river played in their lives. The pre-1890 landscape reflected the recursive relationship between the community and the physical environment of the river. Changes in the landscape both mirrored and generated changes in the social framework.

The transition to the period of invisibility of the river occurred over a span of thirty years, when a combination of intensive efforts to tap an artesian flow and introduction of pump well technology exacerbated an already tenuous situation brought on by extensive humanly-created channel changes, decreased vegetation, and unusually rainy weather conditions. The 1887 earthquake and soil destabilization caused by wagon roads and livestock trampling may also have played a role in subsequent events. Whatever the precise causes, the result was a river which, over succeeding years, cut its bed into
a deep, steep-sided arroyo. This entrenchment activity disrupted the flow of the springs which not only fed the river's flow but which also provided important sources of drinking water for the area's residents. Combined with the effects of pumping water from the underlying aquifer, surface and near-surface flows disappeared.

Once the flow disappeared and residents discovered that pump technology would supply them with water in quantities that would allow them to pursue social reproduction unrestrained by water scarcity, the river became a forgotten relic. The arrival of the railroad had already stimulated urban development to the north and east of the old presidio, and the apparently unlimited availability of water extracted via mechanized pumps meant that the river was not needed for residential growth. Likewise, the availability of inexpensive power and equipment to derive water from the ground meant that farming could be expanded into areas quite remote from the river. Residential and agricultural land use patterns are tangible manifestations of the social restructuring which occurred as a result of changes in resource availability made possible by the introduction of the deep draft pump and improved transportation capabilities.

Awareness of the river between 1920 and 1974 continued to be minimal, in part due to the absence of major flood events. The extent to which awareness of the river faded
is illustrated by the degree to which the floodplain was developed in dangerous disregard of the river's flooding and erosional potential. Such development was begun in the 1930s, but did not reach its peak until the late 1940s and early 1950s. During these years, houses, motels, and business establishments stood alongside landfills and sand and gravel operations on the river's floodplain. To make matters worse, the overburden associated with the building of Interstate 10 during the 1960s was dumped over the banks of the river. Wildcat dumping was also commonplace.

These changes in the landscape reflected, and interacted with, the social processes of the community. Especially significant was the transition from definition of the riverine landscape as a functional part of the community in terms of the land and water resources it offered to that of a receptacle for wastes, a drainage system for removal of urban runoff, and an area of blight.

Economically, the 1920 to 1974 era was characterized by local boom and bust cycles tied to national events such as World War I, the Great Depression, World War II, the Korean War, and the large-scale migrations of families which began shortly after the second World War. Money was to be made in cotton, especially when subsidized by government price supports, and in copper as long as there was a war to support. The military presence in Tucson grew, with the establishment of Davis-Monthan Air Base and
the opening of associated aircraft industries.

Tourism flourished, and the area became a prime destination for retirees seeking to escape cold winters or to settle permanently in a more benign climate. The attractiveness of the climate, and thereby of Tucson as a tourist, migration, and retirement destination was enhanced considerably by automobile ownership, air conditioning, and swamp coolers.

Flood control was an issue during this time period, but mainly in regard to handling the diversion of flows from developed areas of the city, not in the management of floodplain land along the river to mitigate losses from flood events. The first of the proposals to create a park along the Santa Cruz dates from this time (Hard and Doelle, 1978), but it would be two decades before a conjunction of individual initiative, enhancement of financial resources, and institutional change would provide enough momentum to change the social definition and physical appearance of the landscape.

The era could best be characterized as a period of great faith and belief in technological advance to solve humanity's problems. The result was the disassociation of individuals from the hazards of their environment.

A renewal of awareness of the Santa Cruz River and its potential for damage as well as for improvement of the inner city arose in the late 1960s and early 1970s, at a
time when social and political changes at the national level generated enhanced interest in environmental and historic preservation, as well as in recreational opportunities.

The increased visibility of the river can be attributed to a number of factors, all of which converged in Tucson from the mid-1970s to approximately 1980 and generated important interactions between individuals and groups, local, state and federal institutions, and a variety of rules and resources. The various pieces of legislation which sought to control floodplain development, improve environmental quality, preserve cultural resources, expand local recreational opportunities, and conserve natural resources were significant factors in the restructuration process which ensued. Also important was the fact that the 1970s was a time of fairly abundant federal funding for projects at the local level, allowing planners to design large-scale projects.

Inner city revitalization was high on the agenda at all levels of government, particularly in the wake of gasoline shortages which occurred during that time period. The motivating force behind the movement toward renewing inner city vitality was the concern to increase metropolitan densities so as to promote alternative means of transportation, as well as to "cure" inner city blight.

The development, much of it speculative, which
occurred between 1977 and 1982 resulted in the loss of considerable portions of the land which were to be used for open space. After the flood of 1983, when it was decided to increase the maximum flood level that the channel was to be designed to convey, the options became even more restricted. In order to create a channel which would convey the larger flows, it was necessary to make the channel either deeper or wider. Since making the channel deeper would cause significant problems elsewhere along the stream course, it was decided to make the channel wider in critical reaches. Making the channel wider, of course, limited the amount of land that was left for park development (Fonseca, 1989). The ensuing landscape, that of a narrow park bounded by private development and high, stabilized channel walls represents the political and economic choices which grew out of the structuration process.

In general it could be said that the actions taken over the years have led to a landscape that has become less able to respond to changes in physical or social conditions. Options for future action have steadily become more constrained. Should new technologies be developed, it is always possible, of course, that future options could be expanded. However, from the perspective of current technologies and funding availability, alternatives are significantly constrained.
Only during the days when semi-sedentary Indians farmed the floodplains, and during the days when development was restricted to higher ground and residents sought to produce enough from river waters to satisfy their own needs were options maximized.

The introduction of permanent structures on the floodplain, including diversion works as well as dwellings and commercial enterprises, introduced a new level of risk. As floodplain encroachment intensified, the stakes became progressively higher, and the options for responding to natural events on the river became more and more restricted to engineered solutions. The option of retreating from the floodplain has always been available, of course, but a social framework which derives its vitality from capital accumulation and monetary exchange with areas remote from the immediate locale is itself too rigid to allow the non-productive existence of land tied to that capital.

The Santa Cruz River, since the initial flurry of activity between 1974 and 1982, has again lapsed into invisibility. The promises so lavishly described in newspaper accounts have not been fulfilled. Residents along the river look at the success of the Rillito Riverpark to the northeast of them, and wonder if they have been left on the short end of things yet again. There are some who use the park, especially for jogging, but the landscape continues to present a rather desolate
appearance. The lack of a continuous path, uninterrupted by major streets or tributary drainageways limits its attractiveness for linear recreation, such as bicycling.

During 1989, interest in developing the Santa Cruz River has arose once more, partly due to activities such as channelizing the river, developing a master plan for an integrated system of trails in the Tucson area, and renewed interest in developing the San Agustin Mission site at the foot of Sentinel Peak. Current plans call for completion of the Riverpark from Los Reales Road to at least Cortaro Road by 1995 (Huckleberry, 1989).

The interest in developing the San Agustín site has become an issue again at least in part because of proposed plans to extend a road across it. Preservationists have been hard at work to promote an alternative routing of the road, one that would bypass the parts of the site slated for park development. Unanswered to date, however, are questions concerning the possible need to vent the former landfill site in order to relieve dangerous buildups of methane gas.

The disappearance of water from the Santa Cruz, while certainly detracting from the attractiveness and usefulness of the stream, may not have been as important as the disappearance of the lush riparian vegetation that once lined its banks. Previous research has indicated that vegetation plays an important role in the social
construction of riparian landscapes (Zube and Simcox, 1987; Zube, Friedman, and Simcox, 1989). Further research, focusing on the relative merits of riparian areas characterized by dry streams, as opposed to areas having flowing streams, would be a useful addition to the literature.

With specific reference to the Santa Cruz River, a cross-cultural study of the relative value which various social groups place on different kinds of landscape elements (including vegetation) along the river, especially along the highly-engineered stretches being incorporated into the riverpark, would also be a useful addition to the literature and could prove helpful in the development of plans for linear park systems created along water courses.

A series of informal interviews were conducted with individuals who have been involved in the riverpark project. These interviews have revealed the ways in which the interaction between vegetation and engineered flood protection works affects perceptions of the environment. The channel engineering works currently underway have been described as resulting in a "sculpted canal" look, rather than a riverine environment. One interviewee, reflecting on the circumstances in which engineering plans for the channelization work were undertaken commented that, had the Request for Proposal issued by the City for the bank protection works allowed more latitude to incorporate
factors other than bank protection and flooding, and if at the time it had been possible to assemble an interdisciplinary team which incorporated experts from other disciplines (such as riparian area specialists), it might have been possible to design a channel which was more interactive with the riverine environment than that which is currently being built (Zeller, 1989). Such comments reveal that institutional constraints posed by governmental and bureaucratic entities may be more influential in the outcome of humanly-designed landscapes than are the recommendations of the specialists who design those landscapes.

Although much of the channelization work being done has paid little attention to the interactive nature of a riverine environment, there have been a few attempts to mitigate the impact of those works. Notably, deliberate attempts have been made to soften the impact of soil cementing in the areas between Mission Lane and Speedway. This has been done by finishing the surface of the cemented banks to create an appearance similar to the natural banks, or by designing the soil cement so that, over time, the surface is "eroded" in a manner that somewhat mimics the natural banks (Fonseca, 1989; McCoskey, 1989).

It is ironic that the channelized portions of the Santa Cruz River have come to imitate the irrigation canals which once dissected the floodplain and which themselves
were imitations of nature. The channelization of the city's major watercourses has met with mixed reviews. Recent research has revealed that many members of the community would prefer that the riparian areas of the water courses be retained in their natural state as much as possible. Given the necessity to protect endangered property from flood damages, such a vision for rivers like the Santa Cruz is probably not entirely possible.

However, because a riparian landscape is more the product of the interactions between watercourse and the adjacent land than of a sharp boundary between two natural elements (land and water), bank stabilization works and landscape designs which both minimize the "engineered" aspect of the landscape and maximize the interaction between the river and its floodplain might stimulate greater usage of the park areas. Such increased usage has the potential to "spill over" into enhanced activity in the central business district, thus going some way toward one of the initial goals of the riverpark project: to revitalize the heart of the city.

Suggestions for improving human design of the riparian landscape include the use of plant species which are native to the immediate river area. This has been seen as a way in which a landscape could be created which was more representative of the interaction between the river and the adjacent land. Plants chosen for the park segments already
completed have included species viewed as inappropriate for use in a riverine setting and for wildlife habitat. The non-native species used, in particular, have proven to have minimal wildlife habitat value (Dixon, 1989; Zeller, 1989).

More care in selecting plant species and in deciding where and how they are to be planted has been seen as a way to create a landscape in which the boundaries between the cemented channel and the adjacent land areas are softer and more interactive, thus reflecting more closely the associations between channel and bank areas which occur in natural settings. Further research in this area could contribute to increased understanding of the role vegetation plays in the social construction of riverine environments.

A relatively small group of individuals and groups within the Tucson area have worked tenaciously to preserve and enhance the area's physical and cultural environments. In times when external funding was available, plans could proceed. In times when funds have dried up, as they have for the last ten years, the projects have gone dormant. However, they have not died. The necessity remains to find ways to live within constraints imposed by the physical environment and to ensure acceptable quality in vital resources such as soil and water.

Maintaining the visibility of the Santa Cruz River as a clean and well cared for environment could go some way
toward reminding people that only through attention to how human actions affect the environment can health and well-being be safeguarded. Because of the importance of groundwater to the community's survival, and because the areas of greatest recharge are in or near stream beds, the Santa Cruz Riverpark is an ideal site for the development of educational displays and programs aimed at protection, conservation, and wise use of water. Research into the potential for this sort of project could prove productive.

Care must be taken, however, that any plans to create educational, recreational, and cultural amenities along the river take into account the needs, desires, and customs of the people who live in the immediate vicinity. As suggested in 1975 (Arizona Daily Star, August 18, 1975), cultural barriers could be eased by sensitive planning and development of the area. But such sensitivity requires a genuine effort to draw into the planning and development process the people who stand to be most affected. Mexican-Americans, who continue to feel politically underrepresented, and Native Americans, who appear not to be represented at all, must participate fully. This multicultural participation is especially essential in the development of historical sites along the river and in the creation of interpretive programs to communicate the area's history to residents and visitors. Not only might the results of such efforts more effectively address
multicultural issues, but the investment of these groups in the park should provide a very effective force for ensuring that the park remains an inviting place to recreate.

To this end, future research could productively be done in delving into Mexican-American and Native American connections with the river. Also productive would be research into how park and open space use varies according to ethnicity, class, and gender. Finding more effective ways to draw the various westside groups into the planning process might serve as a step toward reducing the ill feelings that continue to simmer just below the surface.

The landscape of the Santa Cruz River has reflected the historical interactions among political, economic, and social institutions of Tucson, and between those institutions and the physical environment. Politically, the river has been the stage for a series of confrontations between those whose use of the land and water is based on an established social framework, and those who seek to change that framework to achieve their own goals.

The results of these confrontations have been changes in the rules regarding access to, allocation of, and patterns of utilization of the land and water. Technological innovation and infusions of capital have been two of the primary external resources which have enabled such changes to occur. Changes in rules, and the
increasing influence of the federal government in local activities have also played a significant role in the ways in which changes in the landscape have been actualized. The role of floodplain regulations and requirements for floodplain development have been particularly influential in recent modifications of the riverine landscape.

Economics have also played a powerful role in the structuration of the river and its landscape. As mentioned above, the availability of capital to undertake water development projects and to generate profits from land utilization activities has resulted in the loss of surface and near-surface flows, introduction of mechanical water pumps, and an engineered channel with stabilized banks. Governmental funding for flood control projects and park development have, in recent years, been influential in the ways in which the river and its floodplain have been modified.

Land use patterns have reflected the influence of the economic systems of the various social groups which have dominated the landscape. From the subsistence farming of the Indians, the economic order changed into one supporting a Spanish frontier military fort. The arrival of the Anglos introduced an era of activities grounded in capital accumulation. Capital formation has continued to be a dominant factor in the social process, but the interaction between this activity and the other factors in
social production have produced quite different landscapes along the Santa Cruz River. The most prominent change has been the transition from floodplain agricultural activities to urban development.

Social processes have interacted with political and economic processes in floodplain development. The tensions between the Spaniards and the Indians, and more recently between the Hispanics and Anglos have played a role in interactions with the riverine environment. One of the most apparent manifestations on the landscape of this interaction is the presence—and persistence—of the Hispanic barrios along the central stretch of the river.

Within the dominant culture, social process has determined the choices that were made regarding management of the riverine environment. The primary direction these processes has taken has been toward the use of engineering techniques and modern technology to reinforce dominant social values, rather than to change those values so that utilization of the river and its floodplain is more realistically in tune with the natural regimes of desert streamways.

Political, economic and social factors do not alone account for the historic evolution of the landscape of the Santa Cruz River. The physical environment has also been important, especially in terms of the ways in which changes in the fluvial regime have stimulated activities in the
other three spheres. The disappearance of surface flow, the entrenchment of the river, overbank flooding and bank erosion, and the disappearance of the native riparian vegetation have all been factors not only in visible changes in the landscape, but also changes in the ways the community restructured its political, economic, and social mechanisms to address the problems posed by the physical changes. A notable example of this interaction is the enactment of floodplain land use regulations, initiation of flood control projects, and development of the Santa Cruz Riverpark, all of which have been undertaken simultaneously in a multi-faceted attempt to (among other things) reduce the risks associated with flooding, revitalize a blighted inner-city area, and fill a growing demand for local recreational facilities.

Current efforts to improve the Santa Cruz landscape reveal that competing ideas exist concerning what that landscape should look like and how it should function. Past decisions have constrained current choices regarding not only an engineered versus a natural channel, but also the options available for undertaking historic preservation activities, creating park areas, and pursuing commercial development.

Whereas historic preservation would communicate an image of a city in touch with its own multi-ethnic past, recreational and open space development implies a community
which values the benefits of outdoor activity and preservation of the natural environment. Commercial development, currently the dominant activity along much of the river, reflects the city's ongoing commitment to private property rights, including the right to utilize that property to maximize capital accumulation. Any change in this trend will require significant changes in the dominant social values of the community, leading to a modification in the criteria by which resource utilization choices are made. In the past, changes in values occurred when a new social group has assumed dominance. Such changes could also be made through formal educational efforts, utilization of mass media to transmit information, and expansion of local networks to disseminate information in a more informal manner.

From its beginnings as an Indian agricultural settlement through its roles as a remote outpost of Pimeria Alta, as a land of entrepreneurial opportunity and agricultural utopia, as mecca for twentieth century migrants and nomads seeking an easier life in gentler climes, and as a center for development interests, Tucson has alternately used, abused and rediscovered the river as a valued component within its social framework. In each of the periods discussed in this study, a distinctive social discourse, physical landscape, and set of institutions has been apparent. These, in turn, have
comprised elements in the social structuration process of the community, with individuals and groups interacting recursively with its institutions and with its natural and human-made environment. The recursive relationships and processes themselves have been mediated by various rules and resources regarding allocation of water, appropriation and use of land, and selection of elements from the social/cultural sphere to be preserved and enhanced.
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