LANDSCAPE ARCHITECTURE THEORY

AN ECOLOGICAL APPROACH

MICHAEL D. MURPHY

Landscape Architecture Theory: An Ecological Approach

ONLINE APPENDIX:

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APPENDIX A

ECOLOGICAL FACTORS TO BE CONSIDERED IN DESIGN

Irrespective of location or user group, there are a number of site considerations that typically guide future design interventions. These factors are evaluated to provide information about how or whether activities should be incorporated into a future landscape setting. A general checklist of the ecological factors bearing on a site's suitability for development include:

Topography

Typical base data include a relief map of the site at a convenient scale, with surface features and contour intervals appropriate to the detail required for planning or design decision making. Site analysis from the contour information may include the determination and mapping of:

- watersheds and drainage patterns
- moderate and steeply sloping areas of the site
- compatibility of slope or landform relative to intended uses
- difficulty anticipated in using the site for the activities intended
- potential influence of site topography in satisfying handicapped user accessibility
- site visibility and visual exposure resulting from land relief
- wind and solar exposure resulting from site slope and aspect
- extent of land-form modifications, such as cut or fill, and their likely costs
- potential difficulty in site drainage due to excessively steep or level conditions
- potential hazards from steep, precipitous or unstable topographic conditions

Geology

Typical base data include a map of surface geology, with indications of formation, depth to bedrock, and strata inclinations. Where mapping is the result of test borings, descriptions of the underlying strata may be provided. Areas of earth-fill or deposition conditions would also be identified where applicable with a general description of the nature of the deposited material. Site analysis may include:

- structural support and stability of underlying geologic formations
- bearing capacity of subsurface strata and influences on structural design
- determination of ease or difficulty of excavating material near the surface
- determination of cut-slope stability for material near the surface
- determination of water-bearing strata near the surface
- stability of material relative to subsidence or fault movement potential
- potential for settling or contamination from areas created by fill material
- visual implications of exposed geologic material or rock formations
- identification of potential geologic hazards

Soils

Typical base data include a map of soil types for the site, with accompanying cross-section profiles and/or descriptions indicating surface and subsurface conditions to a depth of four to six feet. Site analysis may include:

- suitability as structural support for the location of buildings or roads
- soils expansion and contraction potential relative to the location of structures

• suitability as construction material such as earth fill, building aggregate or road base

• soil suitability for water retention as impoundments

• soil fertility and mineral structure regarding the potential to support plant growth

• soil moisture relationships relative to plant growth requirements

• soil drainage capacity for percolation through soil horizons

• determination of areas with permanently saturated soils

• erosion potential of soils in drainage paths or on moderate to steep slopes

• appropriateness of different soil conditions for the location of intended uses

• corrosion potential for below-grade structures and utilities

• determination of the extent of soil modification to support intended uses

• determination of potential hazards such as erosion or soil slippage

Hydrology

Typical base data include descriptions of surface and subsurface conditions. Surface conditions may be interpreted from topographic and soils data. The extent of periodic surface flooding is obtained from soils maps, historical records or engineering calculations. Subsurface conditions are normally taken from well records or boring logs or inferred from geologic data. Site analysis may include:

• existing drainage patterns and impoundment areas as illustrated by site topography

• extent and frequency of surface inundation in floodplains and floodways

• presence of permanent or seasonal wetlands

• erosion or deposition patterns along drainage channels

- anticipated peak flows of stormwater drainage and their contribution to flooding hazard
- potential for changes in land use in upper reaches of watersheds draining onto the site
- seasonal fluctuations in stream channel flow
- depths, duration and fluctuation of seasonal water table
- existing and potential quality of surface and subsurface water
- aquifer locations and zones of surface recharge potential
- potential for groundwater pollution from existing or intended site or near-site uses
- potential for surface water pollution from existing or intended site or near-site uses
- potential water detention locations and holding capacities
- water retention potential for permanent or temporary impoundments
- location, water quality and capacity of on-site stream flow or wells
- ownership and extent of access to stream waters crossing the site
- appropriateness of intended activities to the site water regimen
- extent to which drainage patterns require modification to accommodate intended uses
- identification of potential hazards such as flooding or subsidence

Climate

Typical base data include regional or local macroclimatic averages for precipitation, temperature, humidity, wind velocity and direction, and seasonal extremes. The number of sun days, frost-free days and dates of the first and last

frost may be useful in some cases. Microclimatic information may include solar angles, site aspect, wind screening and funneling effects, fog, cold air drainage and heat traps. Site analysis may include:

- microclimatic locations and variations within the site
- microclimatic comfort variables and seasonal variations
- desirable and undesirable locations or orientations for anticipated use activities
- climatic influences of site vegetation, water bodies, air movement and topography
- influence of prevailing winds on off-site activities or emissions on proposed site uses
- influence of wind patterns on proposed site activities as they affect off-site land uses
- influences of sun angles on slope aspect conditions of the site
- character and seasons of precipitation and its influence on proposed site activities
- seasonal influences on intended use activities or plant growth
- identification of potential hazards such as ice or fog on roads

Vegetation

Typical base data include aerial photographs and/or maps of site vegetation indicating location, species, crown spread, and soil elevation at the base of significant groupings or individual specimens; any published listing of locally prohibited, preferred or threatened and endangered plant species. In some instances, plant community maps with descriptions of dominant and typical species composition may be required. Detailed ecological surveys may be required to include indications of community succession or regression due to past land use impacts on or near the site. Site analysis may include:

- amenity value of existing site vegetation

• use and design performance opportunities afforded by existing vegetation

• appropriateness and compatibility of existing vegetation for intended activities

• susceptibility of vegetation to damage from development or anticipated site uses

• relative stability and anticipated longevity of existing species and plant communities

• seasonal effects of vegetation on humidity, insolation, temperature and ventilation

• influence of existing vegetation on site stability or erosion control

• seasonal influence of vegetation on site image and aesthetic experience

• maintenance implications of retaining existing vegetation

• determination of threatened or endangered species on or near the site

• wildlife habitat conditions and potential of site vegetation for food or cover

• visual, spatial opportunities afforded by existing vegetation

• microclimatic amelioration opportunities afforded by existing site vegetation

• identification of potential hazards such as fires, toxicity, pests or disease

Wildlife

Typical base data include descriptions of existing species and their related habitat requirements and any published listing of locally threatened or endangered wildlife species. Site analysis may include:

• desirability of existing wildlife species relative to the activities intended on the site

• appropriateness of retaining wildlife species with regard to anticipated site uses

• implications of retaining or encouraging the existing wildlife populations

• habitat requirements of existing populations for water, food and cover vegetation

• seasonal and daily corridor requirements for wildlife movement on or through the site

• threatened or endangered species on or near the site either permanently or seasonally

• identification of habitat zones of threatened or endangered species

• identification of potential hazards such as nuisance, disease or pest infestation

• maintenance or activity restrictions resulting from retention of wildlife species on site

APPENDIX B

HUMAN NEEDS FACTORS TO BE CONSIDERED IN DESIGN

General design criteria based on Abraham Maslow's (1970) human behavioral motivators. The landscape setting:

- provides for people's physical needs, such as access to food, shelter or toilets
- satisfies people's need for physical safety, such as traffic safety for pedestrians, the elderly, children or the infirm

- provides for security through considerations such as adequate lighting and universal surveillance
- accommodates socialization through which people interact for pleasure or to attain status and esteem
- expresses adequate information about itself and how it may be interpreted and used to satisfy people's need to learn and understand
- satisfies people's desire for environments of richness and complexity without excessive information overload where decisions are required
- satisfies people's aesthetic needs consistent with their perceptual sensibilities and expectations
- satisfies people's curiosity, arousal and stimulation consistent with the variable levels of engagement desired
- provides people with an ability to limit the stress experienced as a consequence of interaction with the socio-physical environment
- enables people to exercise individual choice in their interactions with others or the environment according to their varying behavioral demands and arousal levels

APPENDIX C

DESIGN PERFORMANCE CRITERIA FOR PUBLIC OPEN SPACE

Summary of design criteria for successful public open space based on Clare Cooper-Marcus' and Carolyn Francis' research in California's San Francisco Bay Area (1998: 9).

The open space is:

- located where it is easily accessible to and can be seen by potential users.
- accessible to all, particularly children and disabled people.
- clearly communicates that it is available for use, and meant to be used.
- provides a feeling of security and safety to would-be users.
- furnished to support the most likely and desirable activities.
- organized to meet the needs of the user group most likely to use it.
- encourages use by different user subgroups without conflicting with one another.
- comfortable, particularly at peak use times, regarding sun, shade, wind, etc.
- incorporates opportunities for engagement or manipulation (lawns for play, sand in playgrounds, interactive sculpture or fountains in plazas).
- provide options for individuals or groups to become attached to the place and care for it through involvement in design, construction or maintenance; by use for special events; or by temporarily claiming personal spaces within the setting.
- easily and economically maintained within the limits of expectation for a particular type of setting.

- offers relief from urban stress and enhances the health and emotional wellbeing of its users.
- supports the philosophical program of the managers of the place (such as education, child care, recreation, hospital therapy).
- beautiful and engaging from the outside and the inside.
- balances attention to artistic expression and behavioral setting. Undue attention to either at the expense of the other may result in an inappropriate and unhealthy (unsuccessful) setting.

APPENDIX D

DESIGN PERFORMANCE CRITERIA FOR OPEN SPACE IN HOUSING

Clare Cooper-Marcus and Frances Sarkissian (1986) have developed a set of human performance criteria for the design of public open space in housing developments. Their design guidelines for successful community building through open space design are summarized as follows:

- promotes homogeneity within residential areas to develop a feeling of community and belonging.

- clusters dwellings for families with similar life-cycle stages, such as families with small children or retirees.
- provides opportunities such as shared community pathways to facilitate casual social interaction near the dwellings.
- meets community interaction needs by providing features such as common recreation areas or day-care facilities.
- locates all community facilities along a common pedestrian path that can be used for recreation as well as access.
- avoids conditions that force interactions where residents have no choice, such as shared driveways or common paths to individual dwelling entryways

Guidelines to promote safe, secure and healthy residential environments, among the highest of personal and community priorities, include:

- enhances community identity and security by restricting access to the area.
- provides for safety and security through visibility and control of entryways.
- promotes security and safety by community surveillance from dwellings.
- provides common open space recreation for children in the residential area.
- ensures access and convenience for children and the less mobile or disabled.
- assures that children are provided with play areas safe from traffic and cars.
- provides for the privacy needs of residents within or near their dwelling.

- provides opportunities for residents to express a sense of territoriality through such means as the flexibility to personalize front lawns and entryways.

APPENDIX E

CULTURAL FACTORS TO BE CONSIDERED IN DESIGN

Irrespective of specific location or user group, there are a number of general cultural considerations that typically guide future design interventions. These factors are evaluated to provide information about how or whether activities need to be incorporated into a future landscape setting. A general checklist of the cultural factors bearing on a site's suitability for development include:

User Groups

Designs are created for the benefit of those who are to use the place envisioned. It is necessary to know whom those people are to determine the kind of activities and amenities to include in design proposals. Typical considerations include the identification of:

• primary population groups to be designed for (residents, employees, students, etc.)

• secondary and tertiary populations (maintenance, security, caregivers, etc.)

• population makeup, unique characteristics and needs of primary and secondary users

• physical and functional requirements of the intended population subgroups

• social and psychological requirements of intended population subgroups

• identification of conflicts, risks or limitations among the likely user populations

• values and aesthetic sensibilities of intended population subgroups

Land Use

Typical base data include a boundary survey map of the site indicating existing improvements, activities or use conditions. Also assembled are land-use and land-zoning maps for the local area, local zoning ordinances and deed restrictions indicating existing and permitted uses in the vicinity of the site under design consideration. Finally, a general inventory of major institutional, recreational and/or commercial activities near the site, all mapped at a suitable scale, to reveal a broad picture of the land-use condition. Site analysis may include:

• relationship of intended uses with other community facilities in the vicinity of the site

• compatibility between adjacent land-use activities and those anticipated for the site

• general character and state of maintenance of site and near-site conditions

• patterns of social organization and activity on or near the development site

• location of hazardous or undesirable emissions or materials production

• location of industries, storage areas or transport activities near the site

Statutory Requirements

Typical base data include identification of municipal, county or state laws with all local, regional, state and national regulations, codes and ordinances governing the development of the site. Site analysis may include evaluation of:

- building and fire code restrictions on the property
- permissibility of the anticipated use activities on the site
- identification of pertinent review and approval agencies
- building setback requirements from each property boundary
- building height limitations or air rights restrictions
- permissible building area or land coverage restrictions on the site
- total- and off-street parking requirements for the intended development
- site access limitations from public streets or thoroughfares
- stormwater runoff control or detention measures required
- flood-control restrictions or floodway development requirements
- historical, cultural or environmental restrictions to development
- required provisions for special populations

Easements and Rights-of-Way

Typical base data include vicinity and site-specific maps of existing and proposed rights-of-way and easements, with descriptions of all restrictions attached or applied to the site. Site analysis may include:

- existing and proposed right-of-way locations and widths along adjacent streets
- existing access or utility easements crossing or adjacent to the site
- potential for extension or expansion of new easements near or through the property
- limitations to development posed by existing easements or rights-of-way
- restrictions attached to the deed of sale

- compatibility between anticipated activities and permitted easement and right-of-way uses

Economic and Social Conditions

Typical base data include demographic descriptions of adjacent populations and maps of local property ownership indicating property values and property tax rates where available. Site analysis may include:

- social character and stability of the local neighborhood
- economic character and stability of the local environment
- potential for synergism between the local neighborhood and the intended activities
- potential for political resistance to intended use activities anticipated on the site
- compatibility between current ownership patterns and anticipated site uses
- potential for change among existing land uses on adjacent or nearby properties
- potential for additional property acquisition adjacent to the development site
- site history and identification of significant cultural features, events or personalities associated with the site or local vicinity

Circulation and Traffic

Typical base data include regional and local circulation and traffic system maps with indications of volume flow and peak periods of activity. These would describe existing conditions as well as proposals for future development or redevelopment of the circulation systems. Plans should include widths of rights-of-way for principal collectors and arterials, and the location of public transport stations and transit lines near or adjacent to the site. Site analysis may include:

- adequacy of the circulation system to serve the anticipated site development

• compatibility of the proposed development with area circulation patterns

• potential for future expansion of the circulation system and its effect on the site

• the influence of area circulation on access to and movement through the site

• accommodation required of the site development for general circulation in the vicinity

• influence of local traffic patterns on vehicular and pedestrian circulation on the site

• restrictions for points of access to connect site circulation with external systems

• influence of local traffic on the safety of intended site uses

• influence of noise from local traffic patterns on intended site uses

• emergency and service vehicle access requirements

• potential conflicts or hazards to be accommodated by the site design

• requirements for developer participation to expand or alter the existing circulation system to meet new demands

Utilities

Typical base data include vicinity and site-specific utility maps showing locations, sizes and available capacities of system components. These would normally include water, sanitary sewer, stormwater, gas, electricity, telephone and cable service with line heights for overhead services, depths for underground lines and flow-line elevations of gravity-flow systems. Site analysis may include:

• adequacy of existing infrastructure to support anticipated site development

• available capacity and expansion potential of existing infrastructure

• compatibility of proposed development with system components and locations

- required locations for connection to gravity flow systems
- required fees or agreements for connecting to public utility systems
- relationships of connection points to site topography and site use opportunities
- potential for rerouting systems to avoid on-site design conflicts
- proximity to and requirements for fire hydrants
- potential cost of system expansion to meet anticipated requirements
- potential cost/possibility of underground placement for overhead services
- visual impact of above-ground facilities and overhead service lines
- visual impact of access points to public utility facilities

Community Services

Typical base data include the identification of social services available to the development site, their quality, proximity, cost to users, and the influence of service locations on site design. Services may be located on vicinity maps to illustrate physical relationships to future users. Site analysis may include:

- availability and nature of security or police protection
- distance to firefighting equipment or stations
- availability of ambulance and emergency medical assistance
- proximity to public or private schools, hospitals, libraries, etc.
- proximity to public parks and recreation facilities and programs
- proximity to public or private transportation lines and stations
- availability and requirements for refuse collection and vehicles
- availability and requirements for snow removal vehicles

Historic or Cultural Conditions

Typical base data include the identification of historically or culturally relevant settings, mapped to identify their location, extent and the nature of their significance. Site analysis may include the location of:

• historic landmarks, buildings or roads on or near the site

• locations of building or settlement sites no longer extant

• settings of historic events such as battle sites, treaty signings or early settlements

• culturally important settings for contemporary events such as festivals or rituals

• culturally significant settings such as holy sites or burial areas

• archeological or paleontological sites

Visual Quality

Typical base data include the identification of visually prominent on- and off-site features, maps of masked and visible areas to and from the site and descriptions of the visual character of the site and general vicinity. Site analysis may include:

• prominent features and landmarks to be incorporated into the site for orientation

• prominent desirable views within, onto or from the site

• prominent undesirable views within, onto or from the site

• visual sequence conditions or potential adjacent to or within the site

• building massing and land form conditions on the site and adjacent properties

• identification of the visual character to be enhanced or retained by the design

APPENDIX F

EXAMPLE DESIGN PROGRAM

DESIGN PROGRAM FOR THE DAVID BOSCH NATURE PRESERVE

PROJECT MISSION

The 7 acre residential property is to be developed as a Public Park and Nature Conservation Area: to provide a place for informal outdoor recreation, to facilitate casual social interaction, and to provide opportunities for contact with nature in a managed semi-natural setting as an integral part of the local neighborhood. Development requirements include:

Outdoor Recreation: Afford opportunities for outdoors recreation that permit experiences of solitude, aesthetic experience and informal physical activity.

Contact with Nature: Afford opportunities for visitors that, in addition to viewing natural scenery, provide an immersive experience and an opportunity for solitude and communion with nature.

Casual Social Interaction: Facilitate opportunities for social interaction to build friendships and positive neighborhood relationships through casual social contact.

Preserve the Natural Ecosystem: Preserve and enhance the existing stream watershed as a viable habitat for indigenous plants and animals.

PROJECT GOALS

The Park and Nature Preserve is developed to achieve the following:

1. PROVIDE FOR INFORMAL OUTDOOR RECREATION
2. PROVIDE OPPORTUNITIES FOR CONTACT WITH NATURE

3. PROVIDE FOR CASUAL SOCIAL INTERACTION
4. CONSERVE AND ENHANCE THE NATURAL CONDITIONS OF THE SITE
5. ENHANCE THE AESTHETIC QUALITY OF THE NEIGHBORHOOD
6. PROVIDE CONVENIENTLY ACCESSIBLE FACILITIES FOR ALL USERS
7. PROVIDE A SAFE AND SECURE ENVIRONMENT
8. ACCOMMODATE FUTURE CHANGE AND IMPROVEMENT
9. MAKE OPTIMUM USE OF EXISTING SITE RESOURCES

DESIGN PERFORMANCE CRITERIA

Development Goals are to be achieved through the satisfaction of Design Performance Criteria, as follows:

1. **PROVIDE FOR INFORMAL OUTDOOR RECREATION**

   - Provide informal open space to support an array of uses and activities
   - Provide open lawn area(s) of approximately 100′ x 200′ minimum size
   - Park is to be open to the public at any time

2. **PROVIDE CONTACT WITH NATURE**

   - Provide a semi-natural environment with improved plant community
   - Provide for prairie restoration on the margins of the parkland
   - Maintain a diverse range of wooded and open landscape types
   - Preserve the semi-natural (naturalistic) character of the park
   - Arrange pedestrian paths to lead users through the site to provide contact with natural areas of different landscape types

3. **PROVIDE FOR CASUAL SOCIAL INTERACTION**

   - Make the site available and inviting to all neighborhood residents
   - Provide a range of opportunities for informal social interaction
   - Locate convenient and comfortable seating throughout the site
   - Shade for seating and footpaths during the summer months
   - Sunny seating areas and footpaths during the winter months

- Provide group seating near the main park entrance
- Benches to be ergonomically comfortable and easily cleaned
- Benches to be of positively draining, low heat absorbing material

4. **CONSERVE AND ENHANCE THE NATURAL CONDITIONS OF THE SITE**

- Improve habitat by providing food source and cover for desirable wildlife
- Manage peak flow of stormwater to minimize downstream flooding
- Maintain uniform sheet flow drainage over open lawn areas for erosion control
- Control erosion along steep stream banks and flow channels
- Control pollution of storm water in the stream tributary
- Improve the quality of soil conditions where new planting is installed
- Improve the quality and complexity of open lawn vegetation
- Planting additions employ native species that improve habitat quality
- Remove invasive exotic or noxious vegetation
- Improve the quality and complexity of the stream corridor habitat

5. **ENHANCE THE AESTHETIC QUALITY OF THE NEIGHBORHOOD**

- Provide an inviting and visually attractive feature of the neighborhood
- Provide a complex environment with open areas, wooded areas, and diverse edge conditions
- Enhance seasonal transitions through selection of plants that visually express season changes
- Provide a street boundary condition that is highly visible and inviting
- Protect the privacy of adjacent residents
- Provide utilities in a way that harmonizes with the site's semi-natural character
- No trash receptacles are to be provided on the site
- Discourage activities likely to generate site litter
- Maintain dark sky conditions on the site at night
- Limited artificial lighting within the interior of the site
- Street lighting is to be consistent with the traditional character of the residential neighborhood

6. **BE CONVENIENTLY ACCESSIBLE FOR ALL USERS**

- Provide a clear sense of entry / arrival and boundary limits for the site

- Meet or exceed ADA access requirements
  - minimum 6' width paths suitable for use in all weather
  - slip-proof surfaces on less than 5% gradient
  - 2% cross slopes on walks
  - accessible seating for groups and individuals
- Provide access ramp through the curb at the park entrances
- Employ footpaths to guide users to park features
- Provide access for maintenance / emergency vehicles along footpaths
- Public sidewalk with lighting along the street frontage to the park
- Discourage car parking at park entry zones
- Provide bicycle parking near park entry zones
- Convenient, unobtrusive access to irrigation controls, utilities and meters

7. **PROVIDE A SAFE AND SECURE ENVIRONMENT**

- Clear visual surveillance from street for residents and police patrols
- Provide clear visibility/surveillance throughout the main areas of the site
- No circulation access to secluded stream channel and densely wooded areas
- Discourage on-street parking at the entry and along the access street
- Positive drainage in the stream area to prevent standing water/mosquito habitat
- Remove existing pond to prevent standing water hazard and mosquito habitat
- Remove toxic and poisonous plant species

8. **ACCOMMODATE CONTINUOUS CHANGE AND IMPROVEMENT**

- Paving constructed with flexible unit pavers for ease of future alteration
- Structures designed to accommodate disassembly and reconfiguration
- Structures are constructed of durable, locally available materials
- Structures designed for ease of routine maintenance and repair
- Plant woody species in locations where future change will be unlikely

9. **MAKE OPTIMUM USE OF EXISTING RESOURCES**

- Provide opportunities for learning about the local environment and history
- Low-intensity maintenance requirements for all features and structures

- Employ durable materials and connections in construction
- Use existing stormwater for irrigation purposes where possible
- Use plants that do not require significant additional resources to thrive
- Make effective use of financial resources available for the project

DESIGN REQUIREMENTS

Required features/elements of the Park and Nature Preserve:

1. Provide group seating areas and picnic tables
2. Provide individual seating areas and benches
3. Paved path to connect all parts of the open areas of the facility
4. Paths on the site are to be paved with durable, easily modified materials
5. Paths on the lower wooded portions of the site are to be gravel surfacing
6. Fence/privacy screen between the facility and adjacent residents
7. Lighting along the access street to be of traditional style on elevated poles consistent with local city fixtures
8. Entry sign with park name and owner identification
9. Provide underground utility lines along the access street and to park use points
10. Provide open lawn play fields on the upland portions of the site
11. Natural habitat restoration along the wooded stream bank
12. Realign and restore the drainage sub-tributary adjacent to the lawn area
13. Provide irrigation in newly planted areas for establishment purposes

DESIGN OBJECTIVES

The following summaries of design objectives, described as design concepts and supporting literature citations are outlined to reveal the intended purpose and predicted benefits of design proposals.

Ecological design concepts:

- The wooded portion of the site to be protected for a maximum area of interior forest habitat with minimum intrusion from the activities in the open lawn areas which function as recreation space (Forsyth and Musacchio 2005: 19). The intensity of activity varies from the most active zone within the centrally located lawn areas to the more sedentary (sitting, picnicking, people watching) on the margin of the lawn areas, to the wooded periphery (both natural and introduced) where limited human activity is encouraged.

- The ecological preserve is to be managed as a remnant patch of habitat situated within the matrix of the primary drainage corridor. It is anticipated that further discovery under use conditions will inform refinements to management practices for both the habitat preserve and the remainder of the corridor, which lies outside the boundaries of the nature preserve.

- People express a need for coherence and order, legibility, and distinctiveness (Kaplan et al. 1998) although the habitat areas require less intrusive management to support a diversity of plant and wildlife species – habitat health is improved with tangled understory and dead trees, although most park users may find these conditions messy and unsafe (Lindenmayer and Franklin 2002). To protect the habitat from pressure for "order" and excessive maintenance, activities and circulation are not provided within the habitat preserve areas.

- Sheet surface flow of rainwater that drains from lawns is to be directed through a wooded edge condition of groundcover and understory to slow runoff speed and reduce peak flow in the major drainage channel flowing downstream through the built up areas of the residential neighborhood.

- Maintenance of the wooded portion of the site is to be limited to permit the active ecological processes to evolve, particularly with regard to the removal of native understory or dead wood required to provide a critical source of habitat for cavity-nesting birds and small mammals (Mortberg 2001: 193).

• Layered vegetation types (canopy, understory, and groundcovers) are promoted at the edge of the woods to provide bird species with adequate habitat opportunities (Raedeke and Raedeke 1995: 142).

• Active penetration of the wooded edge is to be limited to shallow incursions for walking or seating within the wooded areas to limit the extent of interference with habitat quality through maintenance.

• Invasive and exotic plant species are to be removed from the site to help restore a more indigenous habitat supportive of native wildlife species.

• Improvement of growing conditions is crucial to the success of introduced plants (McPherson 1995: 191) with primary attention to be given to amendments that improve the condition and life of the soil, particularly where trees and shrubs are to be introduced.

• A diverse range of selected native plant species is to be introduced to improve aesthetic appeal, habitat quality, and reduce susceptibility to loss from disease or drought (Tilman and Downing 1994, Quigley 2004: 38).

• Lighting is excluded within the park interior to minimize attraction to users during hours of darkness, and thus, limit interference with the wildlife habitat.

• Public paths will be located to divert park users from the habitat area to limit human interference in the nature preserve portion of the park.

• Flowering perennial planting, attractive to butterflies and hummingbirds is to be placed at the park entry and seating area to give park users access to wildlife activity.

Socio-psychological design concepts:

• The naturalistic character of the open lawn portion of the park with peripheral trees and seating is provided to create a peaceful, stress relieving environment with a composed, low complexity setting to offer opportunities for recuperation from excessive arousal or stress (Berlyne 1971; Mehrabian and Russell 1974; Ulrich et al. 1991: 209). Providing

opportunities for contact with nature and for peace and quiet, typically seen as a desirable attribute of urban parks (Schroeder 1982: 320), is intended to afford local residents with a refuge for withdrawal from the normal stresses of urban environments and fast-paced life.

• As environments become more complex, finding one's way becomes more difficult (O'Neill 1991, 259) which is a source of stress from the environment (Carpman and Vaitkus 1984). Improved wayfinding reduces environmental stress and improves access to the landscape. Wayfinding involves orientation and navigation of the site to make decisions about the best route to an intended destination (McCormick 1996: 43). Wayfinding is improved by providing vistas (Garling et al. 1983 and Kaplan, Kaplan, and Ryan. 1998, 99) and landmarks to assist users in spatial location and navigation of the park (Lynch 1960: 78).

• The circulation system employs a coherent central / primary path as the primary route to promote wayfinding by serving as cues to appropriate movement behavior (McCormick 1996: 46).

• Visual cues are needed to direct potential users to what lies within the park (Kaplan et al. 1998: 85). These are provided by a street tree edge condition along Ashburn Street, entry sign and prominent entry gateway to define the site and its primary entrance point.

• Social interaction possibilities are optimized by placing seating in heavily trafficked areas to provide opportunities for interaction where activities can be observed (Cooper Marcus and Francis 1998: 93). Seating is provided at the park entrance, at the central stream bridge crossing, and along the paths throughout the park.

• Unknown and mysterious places attract people to become further engaged to explore and understand them. Because mystery is thought to promote mental arousal and stimulate engagement (Kaplan 1978), the main path into to the park takes an indirect route along a wooded streamside rather than leading directly into the open area.

• Because visibility improves a sense of security, seating areas are placed along the path to provide surveillance opportunities for potential users. This permits the user to observe and decide whether to use the bench

upon approach without prior commitment (Michael and Hull 1994; Fisher and Nasar 1992).

• Tree planting along the street and adjacent to the lawn boundaries are to be kept open for active surveillance from both the street view and from within the park to provide opportunities to easily observe the setting and promote a sense of security (Forsyth and Musacchio 2005: 168).

• Primary tree planting areas between the park path and boundary fence are provided to buffer the activities of the park from adjacent neighbors and minimize intrusion on neighboring residences.

• Active penetrations of the wooded edge by paths are to be kept shallow to limit the sense of insecurity that areas of potential concealment and lack of surveillance might foster (Michael and Hull 1994: 1).

• The edge condition of the park is to be densely planted with trees and shrubs to provide a wooded appearance since users in suburban settings have shown that viewing the park as natural setting with wooded scenery is an active source of visitor/neighbor satisfaction (Schroeder 1989: 104).

• Because children express a preference for constructing their own play structures (Barbour 1999: 96), active child-play apparatus is excluded to promote children's sense of intellectual adventure and creativity in their play rather than preempting the setting with specific forms of equipment.

• Group seating areas are provided at different locations to satisfy the preference of park users to congregate into self-selected groups or age categories (teenagers, elderly, etc.) ((Kirkby 1989: 11; Loukaitou-Sideris 2003).

• Benches with backs and tables with attached seating are provided to assure the comfort of users from all age groups, particularly seniors, who may be among the most frequent users (Cooper Marcus and Francis 1998: 93).

• Sun sheltered seating is provided during summers when shade is necessary for comfortable use, and thus to facilitate interactive social contact and conversation (Hutchinson 1994: 243). Sunny seating is provided during the winter months.

• Individual benches are provided along the path to satisfy people's need for solitude to observe nature and others at play (Cooper Marcus and Francis 1998: 90; Thompson 2002).

• Benches are positioned to provide users with a prospect and refuge condition: a prospect that affords a clear view of the surroundings and a position of refuge offering a sense of enclosure and protection (Appleton 1996).

• Lighting along the access street is provided to enable surveillance along the public sidewalk during times of low visibility to provide safety and a sense of security in an area that can also provide possible concealment opportunities (Michael and Hull 1994: 28).

• Lighting is not to be provided within the park interior to avoid attracting users into a potentially unsafe setting during hours of darkness.

Aesthetic design concepts:

• The open areas of the site (the open lawns and path edges) are designed as a quasi-savanna / park setting to conform to most people's general preference for conditions characterized by "smooth groundcovers, scattered trees, and depth or openness" (Ulrich 1986: 32). Preferred tree type has a dense upper canopy and little understory (Schroeder 1989: 90 and Gobster 1994). The open savanna type park is intended to serve as a visual foil between social contact areas with consciously-formed planting and the less manicured, heavily understoried character of the woodland habitat zones.

• A park with extensive open lawns makes the site seem larger while visible buildings can make them seem smaller (Talbot and Kaplan 1986: 89). To make the park seem more expansive, the park provides large lawn areas that are edged with dense tree plantings to screen adjacent residential buildings and provide a larger, more "natural" and spacious appearance within the park.

• The existing tributary drainage channel is to be realigned and designed with additional planting (stream bed, canopy and groundcover

understory) to provide greater visual interest and complexity within the park setting.

• An arbor-covered seating area at the entry of the park, with support for flowering vines overhead is provided as an attractive feature of the park, visually accessible to either park users or casual passersby.

• Flowering perennial plants are to be located at the entry and along the realigned streambed as a visually attractive entry feature of the park.

• Trees that accentuate seasonal change are selected to provide spring and fall color and provide attractive visual stimulus within the park.

• Overhanging shade trees are provided along the street and the park path to create an inviting setting to attract users.

• Street lighting fixtures are to integrate with existing heritage fixture format employed in other neighborhood locations by the city.

Management design concepts:

• The park path is to be used to form a boundary between the more actively maintained lawns and the less intensively maintained groundcover and prairie restoration areas of the park grounds. Park paths are positioned to serve as maintenance edges to simplify mowing and edging.

• Most tree planting and native prairie reestablishment is positioned within the limited maintenance zone outside to lawn areas to minimize edging requirements around tree trunks or shrubs.

• Groundcover planting is located under the tree planting adjacent to boundary fencing to eliminate most mowing and edging along fence lines and under trees.

• Undesirable and exotic invader tree species are to be removed from the lawn areas to eliminate unnecessary edge maintenance within the lawn areas.

• Hardy (indigenous) grass species are used in some of the lawn areas to reduce the need for long term irrigation.

• Preference for native species in the introduction of new planting is included to reduce the cost of cultural and irrigation requirements for park plants once they have become established.

• Park structural amenities (paths, benches, shelters) are to be constructed from materials that can be disassembled and reused or relocated to facilitate further alteration and improvement, as more becomes known about what features or locations might better serve the community in the future.

PLANTING DESIGN

To preserve and enhance the ecological integrity of the Park and Nature Preserve, primarily native plant species are recommended for initial and subsequent planting introductions on the site. The plant palette for the Park and Nature Preserve includes:

Trees:

1. Bur Oak (Quericus macrocarpa)
2. Live Oak (Quercus virginiana)
3. Shumard Oak (Quercus shumardii)
4. Texas Red Oak (Quercus texana Buckley)
5. Water Oak (Quercus nigra)
6. Cedar Elm (Ulmus crassifolia)
7. Winged Elm (Ulmus alata)
8. Osage Orange (Maclura pomifera)
9. Dogwood (Cornus florida)
10. Texas Mulberry (Morus microphylla)
11. Common Persimmon (Dyosporus virginiana)
12. Carolina Cherry Laurel (Prunus caroliniana)
13. Mexican Plum (Prunus mexicana)
14. Texas Redbud (Cercis candadensis var. texensis)
15. Western Soapberry (Sapindus soponaria var. drummondii)
16. Honey-Locust (Robinia pseudoacacia)

Shrubs:

1. American Holly (Ilex opaca)
2. Possum-Haw (Ilex decidua)
3. Yaupon Holly (Ilex vomitoria)
4. Dwarf Yaupon (Ilex vomitoria var. Nana)
5. Rusty Blackhaw (Viburnum raffinesquianum)
6. American Beauty-berry (Callicarpa americana)
7. Indian Currant Coralberry (Symphoricarpus orbiculatus)
8. Sandhill Plum (Prunus angustifolia)

Vines:

1. American Wisteria (Wisteria frutescens)
2. Coral Honeysuckle (Lonicera sempervirens
3. Mustang Grape (Vitis mustangensis)
4. Peppervine (Ampelopsis arborea)
5. Trumpet-creeper (Campsus radicans)

Groundcover:

1. Texas Lantana (Lantana urticoides Hayek)
2. Common Lantana (L. camara var. Dallas Red)
3. Turk's Cap (Malvaviscus arboreus var. Drummondii)
4. Autumn Sage (Salvia greggii)
5. Scarlet Sage (Salvia coccinea)
6. Blackcurrant Sage (Salvia microphylla)
7. Mexican Petunia (Ruellia brittoniana)
8. Wild Petunia (Ruellia caroliniensis)

Grasses:

1. Buffalograss (Buchloe dactyloides)
2. Common Burmuda (Cynodon dactylon)
3. Little Bluestem (Schizachyrium scoparium frequens)[climax]
4. Big Bluestem (Andropogon gerardii)
5. Broomsedge Bluestem (Andropogon virginicus)
6. Sideoats Grama (Bouteloua curtipendula)
7. Longspike Silver Bluestem (Bothriochloa saccharoides)
8. Gamagrass (Tripsacum dactyloides)
9 Sideoats grama (Bouteloua curitpendula)
10. Purple Lovegrass (Erograstis spectabilis)
11. Hairyawn Muhly (Muhlenbergia capillaris (Lam.)
12. Indiangrass (Sorghastrum nutans (L.) Nash [climax]

13. Virginia Wildrye (Elymus virginicus L. var. virginicus)
14. Brownseed Paspalum (Paspalum plicatulum)
15. Switchgrass (Panicum virgatum L.) [climax]
16. Purpletop tridens (Tridens flavus (L.) Hitchc.) [climax]

Forbes/Wildflowers:

1. Black-eyed Susan (Rudbeckia hirta)
2. Clasping Coneflower (Rudbeckia amplexicaulis)
3. Drommond Phlox (Phlox drummondii
4. Indian Blanket (Gaillardia pulchella)
5. Indian Paintbrush (Castilleja indivisa)
6. Lemon Mint (Melissa officinalis)
7. Partridge Pea (Chamaecrista fasciculata)
8. Pink Evening Primrose (Oenothera speciosa Nutt.)
9. Plains Coreopsis (Coreopsis tinctoria)
10. Texas Bluebonnet (Lupinus texensis)

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APPENDIX G

UNIVERSAL DESIGN CONSIDERATIONS

Although each design situation is unique, most designs must deal with a common universe of problems to be solved and opportunities to be created by the interface of the human condition with the landscape. Consequently, a set of universal design considerations, the areas of design most commonly intended, are outlined below.

The areas of intended design improvement – the design questions – serve as a checklist during the early stages of project definition to aid in determining the appropriate array of problem areas. During design deliberation, they direct attention to the performance requirements to be met. After implementation, the design intent questions – essentially, design goals – may be posed as a series of post-occupancy questions to determine whether the new arrangement satisfies all the appropriate requirements. The design questions include considerations of:

Functional utility: Are the activities intended arranged with their supporting infrastructure and circulation systems for optimum integration and functionality? Does the site provide a supportive setting for the functional relationships required by the activities? Are the activities and design features arranged to enhance their mutual functional relationships, both individually and with regard to their influence on the requirements of others?

Adequacy of accommodation: Are the activities or facilities to be provided adequate to meet the known or anticipated needs of the users at an acceptable level of satisfaction? Do the activities address the full range of requirements identified for the proposed setting? Can the activities be supported by the available infrastructure? Can the site as a behavioral setting or ecological system adequately accommodate the intended uses or activities? Is there provision for expansion if demands increase?

Comprehensiveness: Does the design address the complete range of issues to be resolved within the limits of the decision-making process? Does the design address the broad range of expected users and their needs, the site and its opportunities and limitations, the activities to be provided and the culturally specific character of the setting to be created?

Appropriateness: Are the activities and features of the design, and the manner in which they are arranged, appropriate to the context of the natural environment? Are the activities appropriate to the conditions of the local social context and the times? Are the most appropriate materials employed to their greatest advantage, in ways that express their innate qualities? Does the design reflect the values of the owner, the users and the local community? Is the design visually appropriate to the context of the physical setting?

Accessibility: Is there adequate access to activities for all potential users and user groups? Does the general circulation pattern avoid conflicts among the activities provided and with other elements of the circulation system? Is the circulation system integrated into the configuration of the landscape and the general pattern of circulation to which it connects? Is there appropriate visual access for users and other members of the community?

Compatibility: Are the activities to be provided, their supporting infrastructure and access systems arranged for optimum compatibility with one another? Are they well integrated into the ecological and cultural contexts of the site on which they are located? Do the activities reinforce or support the features and processes existing on or near the site?

Health and welfare: Will the individual's experience of the designed setting promote a sense of psychological wellbeing and physical health? Does the design limit stressful conditions for users to an extent that is likely to promote their wellbeing? Is there provision for the health of the social and ecological systems? Does the design appropriately address the users' needs for privacy as well as belonging and interrelatedness with others?

Safety: Does the design create an environment that provides an adequate level of protection for those who use or come into contact with the activities or features provided? Does it convey a sense of predictable safety to the users and the local community? Are activities located to avoid or reduce the potential for risk from development-induced hazards such as traffic conflicts or natural hazards such as flood or wildfire?

Security: Does the design provide a defensible setting? Are community and private spaces defensible against unwanted intrusion from those who might pose a threat to individual safety or social integrity? Does it provide protection regarding potential threats to the integrity of the environment? Does it convey a nurturing sense of psychological security to the users and the local community? Are critical resources and infrastructure arranged for reasonable protection against deterioration, vandalism or criminal acts?

Comfort: Does the design preserve desirable environmental conditions and ameliorate adversities to provide adequate physical and psychological comfort for the users? Does the level of comfort provided pertain to all the desired uses or activities? Does the design address comfort during all seasons, periods of use or times of day?

Convenience: Does the design make life easier for those who use it to engage in their daily activities without undue conflict or effort? Are there provisions for convenience on many levels of activity: accessing the site, engaging in the activities for which the setting is intended, moving from place to place within the setting or for engaging in appropriate levels of social interaction?

Choice: Does the designed setting offer users the opportunity to exercise individual discretion regarding preference in movement, level of engagement, extent of contact with others or participation in desired activities? Are choices available continuously or do they vary depending on the activities intended, timing or location of decisions?

Legibility: Does the design clearly express itself and its relationships to adjacent settings? Does it reveal the provisions being made to facilitate desired activities or those made to discourage undesired activities? Are points of entry, critical destinations or features clearly communicated to those seeking that information? Does the form adequately express its purpose and the nature and use of the materials from which it is constructed?

Wayfinding: Does the design facilitate comprehension of the setting and orientation to place that facilitates wayfinding and movement? Are there sufficient vistas, points of reference or landmarks to enable users to find their

way through the environment and make appropriate choices of movement toward desired destinations?

Resilience: Does the design provide a socially or culturally complex setting in which diverse categories of people can engage, interact or find common purpose? Does the design facilitate harmonious relationships between socially and culturally diverse groups? Does it promote environmental complexity and species diversity to maintain ecosystem stability, health and viability?

Community: Does the design represent a socially responsible alteration of the landscape and contribute to an enhanced state of social integrity, individual participation, and community interaction among those for whom it is intended? Does the design facilitate desirable social engagement among users to strengthen their shared sense of community and provide opportunities for formal and informal interaction?

Privacy: Does the setting provide appropriate opportunities for withdrawal and privacy for ablution, personal reflection or intimacy? Are such opportunities provided in a way that enables those making the choice to withdraw to do so at their discretion without inviting notice, intrusion or sanction from others?

Beauty: Does the design enhance users' attraction to, and appreciation for, the physical setting and the elements within it? Does the design meet users' needs for interrelatedness with place and heighten their aesthetic experience? Does it have a physically and psychologically compelling attractiveness? Can the beauty of the place be comprehended through a variety of senses and is it related to the values and cultural expectations of the users? Does the place express the dynamics of diurnal or seasonal cycles?

Pleasure: Does the designed setting provide the opportunity for experiences that are desirable and actively pursued for the pleasurable benefits they afford to users? Are conflicts resolved? Are there opportunities for intellectual and spiritual as well as sensory pleasure on multiple levels? Are pleasurable attributes available to the full range of likely users or community members?

Sense of place: Does the design promote a culturally specific sense of meaning? Does it incorporate and express regional or site-specific characteristics and features of the natural environment? Is it appropriate to the history and character of the local community or its activities as they have developed over time?

Productivity: Does the designed setting facilitate enhanced activity on multiple levels? Does the setting promote productive relationships to address the users' working, social or leisure requirements? Does it promote the production and maintenance of complex biomass? Does it stimulate improved productivity throughout the local environment, beyond the limits of the property being directly considered?

Economy: Does the design promote economic viability? Does it promote economies regarding the level of investment required for development and maintenance? Are design forms, materials and processes appropriate to the resource base of the local environment? Can the design be realistically achieved and sustained within the limits of available financial and political resources?

Equity: Does the design promote the possibility of rewarding outcomes for the users or local community as well as the developer or investor? Is the likelihood of advantage to members of the local community sufficient that they are likely to support the project's implementation and benefit from its presence?

Efficiency: Does the design provide maximum benefit in development and operation for minimum expenditure of resources to attain a given level of achievement or standard of performance? Do the materials selected have limited embodied energy requirements? Does the design limit the expenditure of energy and resources required for implementation and to sustain its long-term operation?

Adaptability: Is there a realistic opportunity for the design to respond to growth or to adapt over time to accommodate changed circumstances? Can it support use under a variety of conditions, seasons or times? Can the design concept be sustained over the anticipated period of its life span and under the altered circumstances that are likely during that time? Is the design a highly specific "tight fit" arrangement for a limited range of functions, or a more general "loose fit" design that can be easily adapted to multiple functions or future adaptations.

Resource utility: Does the design make effective use of the resources available? Are the site's cultural, physical, ecological, and visual resources used in concert with financial resources to take optimum advantage of the site and its context? Are resources used in ways that reasonably assure their long-term performance? Are visual resources within the perceptual reach of users and employed to full advantage?

Resource conservancy: Does the design protect and conserve the site's cultural, historic, physical, ecological and visual resources? Are the site's resources employed in a way that sustains and enhances their value for future, as well as present generations? Does the design incorporate resource elements of the past into the fabric of the present and extend them into the future in ways that retain their value, utility and viability? Does it confirm cultural and ecological heritage?

Are there provisions for limiting the expenditure of energy and material resources necessary for successful construction, operation and maintenance? Do the materials selected minimize embodied energy?

Recyclability: Can the materials used to create the designed setting be disassembled and reconstituted into new forms with minimal loss and inputs of energy? Is the design constructed of materials that have been previously used in another context? Does the design encourage recycling and reuse of critical features and resources, such as ecological habitats or storm water runoff, with minimum interference or contamination?

Regeneration: Is the form of the designed setting based on materials capable of self-regeneration through natural reproductive or successional processes over time? Are systems designed to promote complexity, resilience and stability? Are materials employed to eliminate the need for continuous maintenance as the primary underpinning of design form? Are plant forms capable of self regeneration over time?

Synergy: Does the design promote creative integration among the site's processes and activities that results in a whole greater than the sum of its parts? Does the design promote the interpersonal integration of the users of the site in creative and productive ways? Does it synthesize the social, economic and ecological aspects of the site to facilitate their mutual support and long-term viability?

Sustainability: Does the design promote self-reliance and reduce dependence on limited resources such as capital, energy or water? Are materials and supporting resources of local or regional origin? Does the design reflect local values to the

extent that the community is likely to support its long-term existence? Does the site, within the limits of available resources or environmental conditions, have the resilience to sustain the setting as an integral element of the ecological system? Can the provided activities be sustained as a cultural setting within the limits of existing infrastructure and circulation systems? Does the design support or reinforce the activities of the surrounding community and the ecosystem? Can the setting support future as well as present users?

APPENDIX H

RULES OF ENGAGEMENT FOR DESIGN TEAMS

Because interdisciplinary process is so unlike single discipline or multidiscipline approaches, team members may have to adopt a few rules, some of which call for interactions that are different from traditional designer behavior. These may be thought of as the rules of polite behavior among team members. These rules of engagement enable the interaction of relative strangers to proceed without undue disruption and improve the chance of reaching an openly agreed, successful conclusion. Sometimes, highly regarded individuals come to be seen as *prima donnas*. But, there can be no *prima* among a team of equals. To avoid this, team participants need to consider the following:

Be a team player

The first consideration in collaborative design is to integrate the different individual personalities into an effectively functioning social group. Teams are formed to take advantage of differences and to pool dissimilar talents; consequently, keeping the team together is a continuing and collective responsibility. To fit into the team environment, designers must find ways to shift their conceptual focus from a role as autonomous individuals to that of team players. Each player has a different and indispensible role to play.

Everyone is equal

By definition, there can be no most or least important players on a team. Only those who are necessary are included and all those who are on the team are necessary. Within a knowledge-building process, it is necessary that the contributions of all members are seen as crucial to overall team success. This requires avoiding verbal or symbolic communications designed to convey an elevated status for any individual discipline or team member. Since all members of the team are selected on the basis of individual excellence, excellence among team members is the norm, not the exception.

Share knowledge

All members of the team have a responsibility for identifying the relevant issues as seen from their perspective and communicating them effectively to the rest of the team. Each discipline contributes to the creation of a comprehensive view of the project. It is important for team members to be aware that their area of expertise may not be fully understood by other team members and to take steps to ensure that the necessary information is communicated clearly and

persuasively. Withholding knowledge to enhance individual position or influence can be destructive to team interaction and learning.

Listen actively

To become effectively integrated into the team, members need to hear and understand the positions of one another. This requires more than just allowing other members to present their views; it also requires that all members assume responsibility for listening carefully, with an open mind, to understand fully the views of others. Unless members achieve this level of understanding, it will be impossible for them to understand the implications of another's insights to their own areas of responsibility. Good team members listen carefully ◎◎to clients, users and one another.

Remain flexible

Because the team is a learning organization, members need to be able to shift position as new information or ideas are absorbed. Unless team members are able to reposition themselves and their ideas quickly, the development of new knowledge cannot influence design outcomes. It is important to remain tentative with all positions until a final, consensual decision has been reached. This means that commitments must be abandoned and reformed repeatedly throughout the process as increasingly integrated understanding emerges from the interactions of team members.

No hidden agendas

All members of the team must be confident enough to reveal their individual goals and aspirations for the project. One of the major obstacles to effective

interaction within design teams is not the result of too many disciplines but too many agendas. Sometimes these are openly stated, but far too often they are not. Hidden agendas can prevent the best-organized team from achieving excellence in design performance. Excellence in a single area may be a common way of achieving exceptional disciplinary results, but it also can lead to mediocre results overall. Participation to satisfy ulterior motives, other than those agreed by the team as a whole, is damaging to team process.

Share the design role

In a team setting, the traditional role of the designer is altered. Particularly during programming and concept development, the designer must act as a facilitator to promote the form-giving influence of other team members and to help form a design team that will, in turn, collectively influence design form. This role requires shifting from a product-as-object to a product-as-process approach to design. During the programming stage, the designer serves more as a player/coach than as a player with primary form-giving responsibility. It is the design relationships rather than the design form that facilitates improvements in the environment to be created and each member of the team has important contributions to make in establishing those relationships.

Share ownership of ideas

Viewing the designer as the primary source of ideas is not only ineffective, it is destructive to team interaction. When teams work synergistically, it is often difficult to determine where ideas originate; they just seem to happen. When team members share in the collective ownership of ideas they become allies in getting them accepted and realized. If only one or a few get the credit, the others

cannot be counted on for full support. What can be counted on is that those who do not receive credit will work against acceptance of the ideas of those who do.

Actively seek critique

The critical evaluation of information and ideas is the team's primary means of feedback. Without feedback there is little learning. Although most people prefer positive feedback, it is negative feedback that provides the most useful insights. Feedback from multiple perspectives strengthens the team's understanding of conditions at the same time that it strengthens the member's ability to think collaboratively. Designers are not always objective in evaluating their own ideas. Because other team members may have less emotional commitment to a particular design concept, they may be expected to respond with greater objectivity – at least to the ideas of others. This allows team members to learn quickly how well a concept satisfies the performance requirements of others, and even more importantly, helps them to unlearn old or conventional lessons; things they thought were true, but only when viewed from a prior or disciplinarily isolated position.

Keep designs impersonal

Critical analysis of design concepts carries the inherent risk that the proposal under review may be unacceptable to other team members. Should this happen and the originators of the concept refuse to accept criticism, the process will not lead to improved understanding. When ideas become team property, critique serves to preserve an attitude of open-mindedness and objectivity, and permits the growth of understanding on which more appropriate design responses may be based. To maintain freshness in approach and to move quickly to gain new

knowledge from design concepts, the team must be able to promote the critical evaluation, and possible replacement of the ideas produced. Doing so is dependent on the team members' ability to separate themselves, and their professional reputations, from their own ideas.

Keep communication effective

One of the most important aspects of successful interaction is positive, two-way communication among the participants. Great care must be exercised in the method of information exchange since lengthy, poorly structured interaction is time consuming and unproductive. In practice, this not only becomes prohibitively expensive but also discourages further communication. The challenge lies in how to encourage more communication rather than just more talk. Alternatively, discussions must not be overly abbreviated in the interest of saving time. Each team member must strive for informative and efficient communication if group interaction is to be productive.

Keep communication positive

Since team members must work closely with one another, it is important that sharp comment on ideas is not interpreted as a personal attack. The openness required for effective team interaction and feedback requires the removal of social masks, which in turn leaves team members vulnerable. Team members must exercise care to avoid destroying this openness and the free exchange of ideas it promotes by the use of careless comments. It is a truism that others will go along with you only if they get along with you. There should be an underlying concern that all communication is expressed as a positive attempt to

improve understanding among colleagues, rather than as a contest of wills between people with competing ideas.

Avoid jargon

Effective team communication and interaction requires the use of a common language equally understandable to all members. As disciplines become more sophisticated and distinct, they develop unique language forms for expression complex concepts in a form of verbal shorthand. Team members uninitiated in a particular discipline will often be unable to decode this disciplinary language. Unless all members communicate in a common language, the necessary transfer of knowledge cannot take place. At times, this may require an explanation of esoteric terms essential to effective communication but these are best kept to a minimum.

Keep focused

For decision making to proceed effectively, the process must focus on the project and its key issues. Unless the project goals and critical issues are the team's primary focus, thinking may slip back into traditional patterns. Once this happens, the creative interaction of the team will diminish. Once lost, regaining focus on the project's uniquely defined character may be impossible. If the group does not agree with an idea of importance to a particular member, that member must accept this and move on. Repeated attempts to bring the team to accept the idea may only have the effect of marginalizing its proponent, resulting in further loss of that member's contribution. This can become a problem if the team fails to understand the background for an issue and it falls to the concerned member to

communicate this as effectively as possible before the discussion progresses too far for recovery. Early explanations are better than late arguments.

Keep to a tight schedule

The need for focus is mirrored by the need for workflow and momentum. Because group work is inevitably slowed by the increased time required for communication, it is important that the time schedule is rigorously compressed to take advantage of as many interaction and feedback cycles, and as many opportunities to build and refine understanding, as reasonably possible. If time is allowed to drag, the process will lose momentum that may never be regained.

Carry a full share of the load

All team members must perform their share of the work, and when necessary, be prepared to do more. Teams have little patience with members who are not, or appear not, to be doing their share. When the work of the project as a total effort is understood as a shared responsibility, then the issue of someone doing only their share does not arise. When all team members observe a sense of shared responsibility for the project, they also rely on one another to provide leadership in the areas of expertise and skill each member represents.

Each of these "rules" of engagement represents a potential area of conflict commonly encountered in team collaborations. If these problems can be avoided, the potential for positive interaction and creative response is advanced significantly. Perhaps the most important rule for managing a team, and one of the most difficult to follow, is to prevent personal feelings from negatively affecting the relationships. Designers are all human and tend to take themselves seriously. If team members can keep focused on what the team is trying to

collectively achieve, and ignore the slight of having their ideas rebuffed from time to time, almost anything is possible. But, if members are overly sensitive to their personal position or individual contribution, the slightest conflict can become magnified to the extent that it interferes with, and perhaps derails, the process.

APPENDIX I

PROBLEM DEFINITION FOR LANDSCAPE PLANNING

Landscape planning is a process of human habitat management on a relatively large scale over an extended period of time. When the process includes consideration for comprehensive management of human activities within the landscape, it may be referred to as applied human ecology planning or applied landscape ecology planning (Ndubisi 2002: 146). But whatever the title, landscape planning is directed primarily toward the allocation of resources (Marsh 1983: 8). Sustainable landscape planning and development recognizes that true economic gains account for environmental and global consequences as

well as local activity (Ahern 1989: 2), and that human and ecological considerations are intimately connected.

Landscape Planning vs Landscape Design

Landscape planning does not address spatial organization or experience at a human scale but at the scale of the landscape, although human values and perceptions may be considered. Landscape planning functions to guide the integration of human activities into the landscape in ways that separate incompatibilities, reconcile diverse uses and relate activities to the landscape to create appropriate settings for life (Laurie 1986: 106). The decisions taken are mainly at the level of policy rather than design or implementation. Because landscape planning operates at a scale greater than design, it also retains greater flexibility between decisions and ultimate development.

Long-range plans are inevitably changed in the time between planning and implementation. As time elapses between planning and implementation, new information (such as improved satellite imagery or economic forecasting) may be gained or conditions (such as market demands or technology) so changed that precise site designs are not practicable. Even when the overall logic of the plan is retained, specific activities may be substituted or alternative provisions for addressing problems may be employed.

Landscape planning provides a comprehensive framework for future designs that links technical and scientific knowledge to actions to change the landscape for optimum results (Friedmann 1973, Fabos 1979).

One of the basic purposes of landscape planning is to accommodate human activities while protecting natural and cultural resources. As a consequence, the

process is based on an understanding both natural and cultural systems, and assessment of outcomes from alternative development scenarios, a process sometimes referred to as **decision modeling**. Forster Ndubisi identifies a series of determinations that make up decision modeling:

• understand the landscape in terms of patterns, processes and interactions

• understand the interactions between development and natural processes

• analyze areas of human/landscape interaction and interdependency

• synthesize assessment outcomes to mediate development/landscape conflicts

• evaluate potential courses of action and their probable effects

• formulate measures to implement preferred options

• monitor the effects of implementation for feedback and improvement (Ndubisi 2002: 139)

Challenges of forecasting at landscape scale

Many models of forecasting rely on traditional technological tools: cost-benefit analysis, demand forecasting and budgeting. These linear, extrapolative methods, however, have demonstrated limited value in situations that have multiple variables – situations in which the social, political, economic and ecological considerations are both interacting and changing continuously. Developing, and largely experimental, methods for predicting how multiple, dynamic variables may interact with one other over time include systems and input-output analyses, environmental impact assessments and cross-impact

analyses. Unfortunately, each order of magnitude of improvement in technology and management also requires greater orders of magnitude and sophistication of the modeling techniques used and greater coordination and control of the processes of decision making (Henderson 1996: 229).

Research is conducted to provide information to reduce uncertainty for decision makers. However, in many cases, the result is that the information provided through broader research methods, such as environmental impact assessments, only increase uncertainty by making decision makers aware of an increased number of things they do *not* know or understand the implications of. The Cartesian approach does not seem to recognize that the development of knowledge requires an imaginative hypothesis as well as careful validation by logical quantitative methods (Henderson 1996: 230).

A more balanced or holistic approach requires both rational and intuitive thinking to achieve comprehensive understanding – what Edward De Bono (1999) calls *critical* and *creative thinking*. Critical thinking is held to high standards of knowledge and prior validation, creative thinking is free to go in any direction without being constrained by what is already known. The rational and intuitive aspects of knowing are not, as many believe, in opposition, but in reality, are complementary. When used together, each balances the weakness of the other and provides a more complete picture of reality and its likely impact in the future.

There are many approaches to the landscape planning process. Most of these are directed toward the implementation of a predetermined development outcome: planning a residential subdivision, for example. In these cases, the answer is largely determined prior to framing the questions. A more open approach to

landscape change might begin with the end product as more of an open question than a predetermined answer. A comprehensive framework for organizing holistic landscape change is proposed by Carl Steinitz (2002). He suggests a procedure that poses six types of questions, each representing an independent level of inquiry related to a theory-driven modeling type. Each level of inquiry requires the management of information and geographic information systems may be used, but each type of model requires a different application.

Six-Level Landscape Planning Model

The six-level modeling approach is employed to identify the context and scope of the project before carrying it to a conclusion about what, or what not to develop. The six questions (and their appropriate modeling types) are:

1. **How should the state of the landscape be described?** In what context, what boundaries, space and time? What is the structure of the landscape?

   (Representation model)

2. **How does the landscape operate?** What are the functional and structural relationships among its elements? What is the function of the landscape?

   (Process model)

3. **Is the current landscape functioning well?** Is it organized to facilitate human and environmental processes and prevent conflicts among them?

   (Evaluation model)

4. **How might the landscape be altered?** What actions can be taken to institute change, where and when?

   (Change model)

5. **What predictable differences might the changes cause?** Will the differences improve the function, character or health of the landscape?

   (Impact model)

6. **Should the landscape be changed?** How is a comparative evaluation of the impacts of different alternatives to be made? Will proposed changes bring about improvement? Are the benefits worth the costs?

   (Decision model)

Steinitz recommends that the framework, which functions as a systematic inquiry into what is and what might be, should be applied in multiple iterations and in reversed numerical order. The application sequence proceeds as follows:

1. Propose (or decide whether) to make a change in the environment.

(Decision modeling)

2. **Predict** the impacts of alternatives for comparison by simulating change.

(Impact modeling)

3. **Specify** (design) the changes to be simulated.

(Change modeling)

4. **Evaluate** current conditions in order to specify the change.

(Evaluation modeling)

5. **Understand** how the landscape works in order to evaluate it.

(Process modeling)

6. **Employ** representational schemata to understand how the landscape works.

(Representation modeling)

This approach to landscape planning operates cyclically through the different levels of inquiry, with each level of investigation taking its definition of necessary contributing products from the previous one. It is offered as a comprehensive way to address the wide range of issues, processes and impacts that are influenced by changes to the landscape. The process is both speculative and evaluative and suggests an approach that is lacking in much of conventional decision making about large-scale landscape development. That is, it inquires about the best set of reciprocal relationships between what is proposed and what exists. This is quite different from a process to facilitate or rationalize decisions in support of a preconceived notion of what the developer wants before an in-depth analysis of the situation has been conducted. Conventional land-use development decisions are almost always guided by single dimensional criteria, most commonly short-term economic gain as opposed to ecological, social or even economic advantages over the long term.