CHAPTER 1

A necessary collaboration

THE BEST DEFINITION OF DESIGN comes from the economist and political scientist Herbert Simon (1916–2001): “Everyone designs who devises courses of action aimed at changing existing situations into preferred ones.”[1] There is great variation in the ways in which people design. “The Design Method” does not exist. Since there is no one single design method, there is no one single geodesign method or path. Nevertheless, any design process for a geographic study area (the “geographic context”) can and should be organized to respond to six questions that are the basis for the framework proposed in this book.[2]

1. How should the study area be described?
2. How does the study area function?
3. Is the current study area working well?
4. How might the study area be altered?
5. What difference might the changes cause?
6. How should the study area be changed?

Geodesign is based on and shaped by a set of questions and methods necessary to solve large, complicated, and significant design problems, often at geographic scales ranging from a neighborhood to a city, landscape region or river basin. Like many problems in the world, usually these are not well defined, not easily analyzed, and not easily “solved.” We muddle about in this very complicated world, sometimes pretending it’s simple. We may only marginally understand the problems, in part because they evolve over a long time frame and involve many actors with many conflicting views. What we do know is that the problems are very important. They are beyond the scope and knowledge of any one individual person, discipline or method. Instead, such problems require both collaboration and ways to organize that collaboration (figure 1.1). People must begin to understand the complexities, and then figure out ways to collaborate — simply because none of us knows everything. We need to find the people who know what we don’t know and figure out ways of working together.

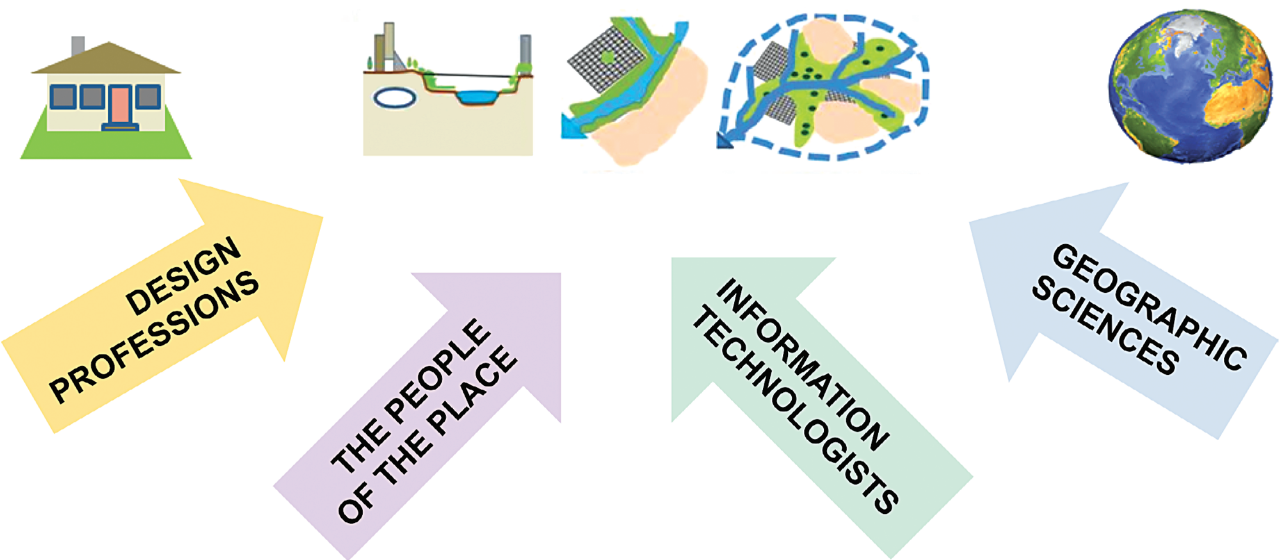


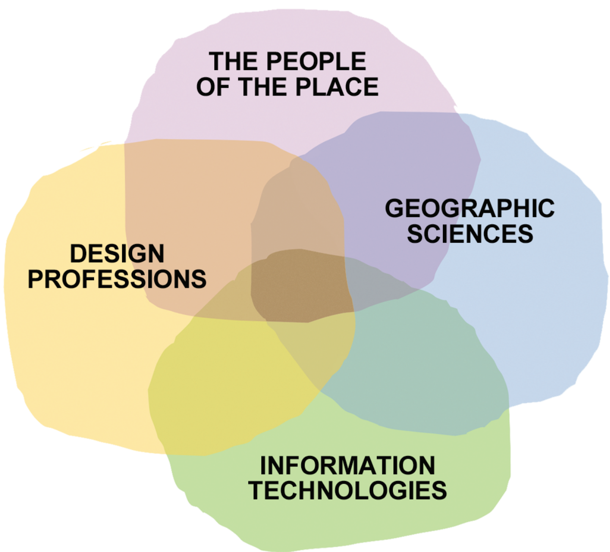
Figure 1.1: **Geography can be changed by collaboration in geodesign.** | Source: Carl Steinitz.

The practice of geodesign requires collaboration among the design professions, geographical sciences, information technologies, and the people of the place (figure 1.2). This is the motivation for a general framework that allows these well-established fields to develop further and collaborate more effectively. Contributing to this outcome is a primary objective of this book.

Four essential groups of people are needed for this collaboration and together they comprise the geodesign team. First, there are the people of the place, a group that changes as a function of the geographical study area. People of the place have two essential roles: they need and request that the geodesign study be made and contribute essential inputs to the study, and they review and make the final decisions regarding what, where and how changes should be made in the study's geographical context. The three other participating groups include (1) the geographically oriented natural and social scientists: geographers, hydrologists, ecologists, some economists, some sociologists, etc.; (2) the design professionals: architects, planners, urban designers, landscape architects, civil engineers, bankers, lawyers; and (3) their technologists.

Great differences and considerable overlap and competition exist *among and within* these groups and yet they somehow must work together. Where are the axes of cooperation? Many designers use technologies and think they know the science but they don't talk to the people of the place. Numerous geographically oriented scientists use technologies to model and understand the environment but they don't propose change for the future. We see local people using technologies and making their own maps, but what does this really do for others? And technologists probably underestimate the difficulty of this cooperation and especially its human aspects, because they too often think that the solutions exist in a computer program. In my view, the technology is the easiest part of the collaboration. The people of the place are the most complicated part, and the geodesign team must understand them. They are the ones who ask us to conduct the study and they will decide what will happen in the future.

The relationship between the design professions and the geographic sciences is one of the more contentious ones within a geodesign team. The geographic sciences are premised on the idea that you build a model based on the past and the present, and you then try to move it to the future. Such scientists are really good at understanding the past and present, but they are not so good at going toward the future. The designers think a lot about the future, but they don't know enough about the present and the past. And that presents the opportunity for a necessary symbiosis that is totally obvious but not easy to achieve. So I am *not* interested in creating people who might call themselves



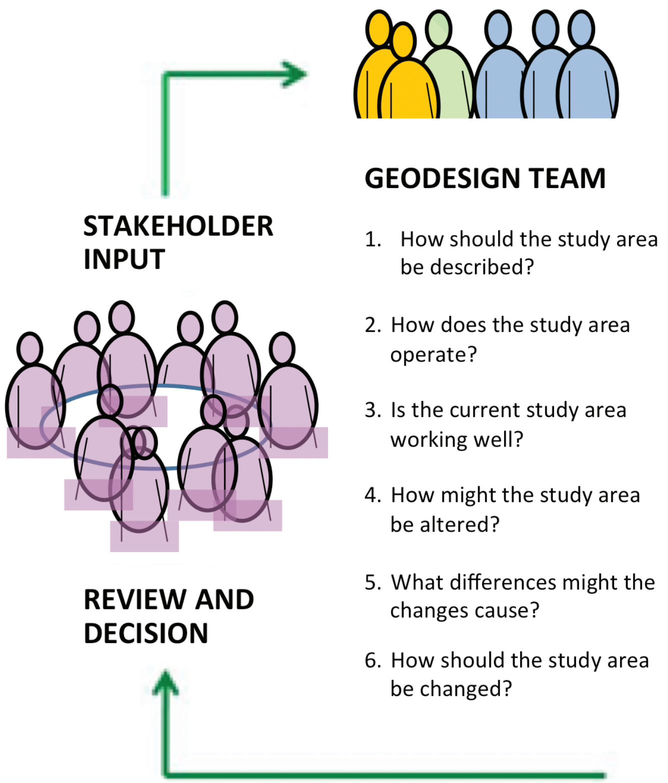


Figure 1.2: **Geodesign requires collaboration among the design professions, geographical sciences, information technologies, and the people of the place.** | Source: Carl Steinitz.

"geodesigners" or making something called "a geodesign." I *am* interested in having people collaborate who know what they are doing, are confident in what they do, and do not lose their identities during the process. That is what I think of as geodesign. It's not a person and it's not a thing. It is a collaborative process, based on a set of questions and methods.

The design professions and the geographic sciences

The relationship between the design professions and the geographic sciences is a fundamental geodesign issue and requires careful attention. Collaboration and cooperation among these groups is not new or unknown, and there is a long history of success. But failures are also common, characterized by competition and *no* collaboration, since such collaboration is neither automatic nor easy. As stated earlier, a principal purpose of this book is to encourage that the working relationships between designers and geographic scientists be efficient and productive. This requires an acknowledgment and understanding of the types of differences to be bridged.

To begin, each group comes to geodesign from a different and deeply-rooted cultural position. Important words are used differently, such as 'theory." From *Merriam-Webster's Collegiate Dictionary*, tenth edition,"theory" is a "set of statements or principles devised to explain a group of facts or phenomena, especially one that has been repeatedly tested or is widely accepted and can be used to make predictions," and "a belief or principle that guides action or assists comprehension or judgment." In practice, the designers' "theory" is the scientists' "hypothesis."

Size and scale are two critical issues in geodesign, yet designers and scientists come to these from opposite directions, seeing the world through differently scaled lenses. Most design professionals learn through small and relatively simple projects that become increasingly larger and more complex, while most practicing geographical scientists work in the other direction, beginning with an understanding of long-term processes that operate at world scales and are then applied at decreasing sizes. In practice, neither of these educational models usually spans the entire range of sizes.

Geodesign activities most often range from a large development project, such as a group of buildings on a complicated site with a large park and transportation infrastructure, through to a new or expanded city, or even a regional watershed studied for urbanization and/or conservation (figure 1.3). Fortunately, these are the geographic sizes and scales at which the two groups' education and capabilities overlap, and at which geodesign can make its most significant contributions. This should make collaboration easier, more productive, and effective.

Another important difference between design professionals and geographic scientists is the structure of their knowledge. Most design professionals are educated as generalists and function that way. In my experience they tend to know *a little about a lot.* For a particular project, they focus carefully on the specifics of a local place and time and emphasize the importance of change. In contrast, geographic scientists emphasize the generalities of processes applicable across space and time. Their education produces specialists, and they know *a lot about a little.* Thus the geographic sciences understand the past and present of a particular geographic study area and seek to conserve its conditions and processes, while the design professions share a focus on the present and find it easier to propose change for the future.

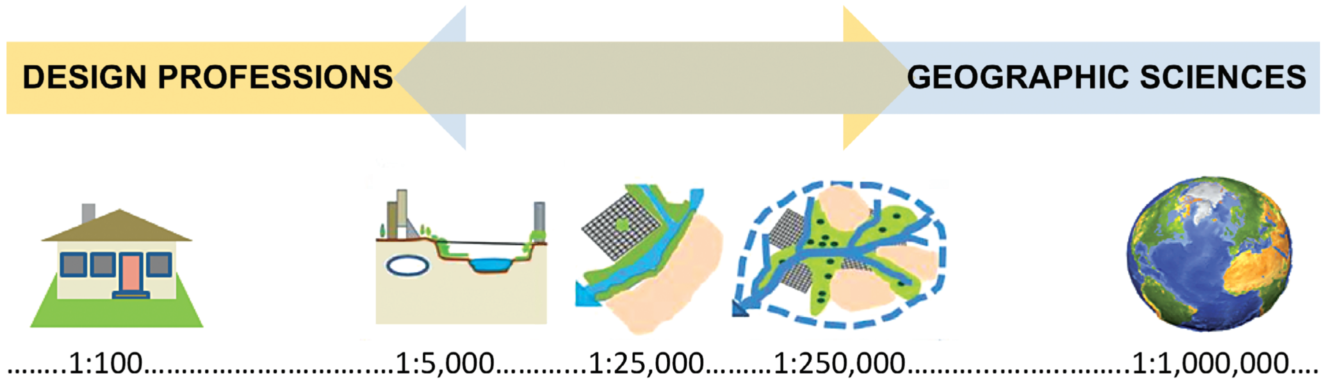


Figure 1.3: Collaboration among the design professions and geographic scientists is likely to be most effective at certain sizes and scales of projects, since by training the groups typically come from different directions in their size of projects and must seek overlap. | Source: Carl Steinitz.

Other important cultural differences between designers and geographic scientists involve their values and roles. After decades of work in this field, I have come to believe that there are clearly generalizable "roles" that greatly influence how we perceive "the people" who are part of geodesign-related activities (figure 1.4). While these are clearly caricatures and most people not only juggle more than one of these positions but change them over time, I maintain that the values of most designers and scientists fall into these branched paths.

What do you believe about the geography, the landscape study area? Do you believe that geography is universal, that you can apply a model of hydrology anywhere in the world or a slope constraint anywhere in the world? Should you practice geodesign anywhere in the world?

Or do you believe that regional geographic and cultural differences exist, and that your analyses, your methods, and your geodesign products should reflect differences at regional scales?

Or do you believe that everything is local, *genius loci,* the spirit of the place? People who believe that every design is a unique experience for a unique place can design for change only after first carefully studying the uniqueness of the place.

The psychologist Henry A. Murray (1893–1988) and the anthropologist Clyde Kluckhohn (1905–1960) wrote: "Every man is in certain respects (a) like all other men, (b) like some other men, (c) like no other man."[3] I believe that this applies equally well to geography. Every place is in certain respects (a) like all other places, (b) like some other places, (c) like no other place. And while all these are true, they are not equal.

What you believe creates your values and your own professional role. In general, you either believe that (1) the people know, or (2) that they do *not* know, but you do. If you believe

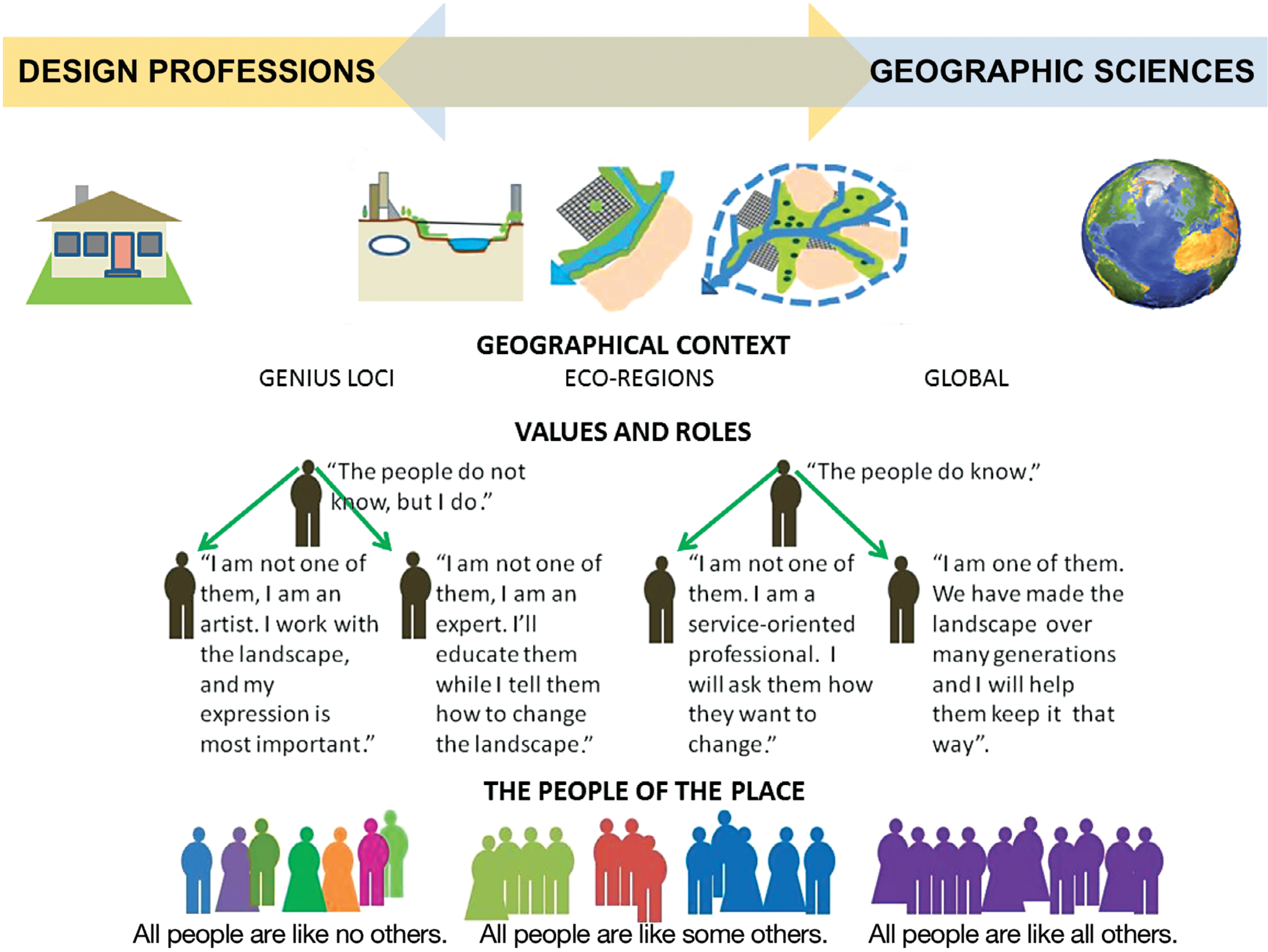


Figure 1.4: **Some commonly held positions in the design professions and the geographic sciences, affecting geographic study areas, geodesign roles, and people. Many designers start on the left side of figure 1.4, believing everything is a unique experience. Many scientists start on the right side of figure 1.4 observing people as anonymous data from which to build globally relevant models.** | Source: Carl Steinitz

the people *do* know, you may say, "I'm not one of them; I'm a service-oriented professional. I'll need to work closely with my clients, I'll ask them what they want, and I'll help them get it." Or, you might say "The people do know and I am one of them. I'll help them (us), possibly to resist change and keep it the way it has been, or we will design and change it together." Depending on where you fall along these lines, you believe things differently about the people of the place. Are they seen as individuals, or represented as groups, and on what bases? Or are they a monolithic "the people"? Many scientists start from this perspective, on the right side of figure 1.4, because the core of their science is observing people as anonymous data from which to build their models.

On the other hand, if you believe that the people *do not* know but *you* do, you also have two choices. You can say "I'm an artist; I'm a designer. I work with buildings or cities or landscapes; I do whatever I do, and my expression is most important. And I'll show it to people and I hope they like it." Or, your perspective may be "They don't know. I'm an expert. I'll educate the people while I tell them how to change their geography. I know better." We all know people like that. Many young designers start from here, at the left side of the figure 1.4 diagram, thinking they know and the people do not, in part because they have been influenced by novels they've read about designers, artistic freedom, and understanding clients.

Geodesign has many sliding scales rather than clear definitions. Things can be true or untrue; it depends on the lens through which you look. But which will be the predominant position for geodesign? The design professions are moving from the left-hand side of the diagram. They tend to seek local differences. The geographic sciences, through their empirical and theoretical scientific study of longer-term change, have a tendency to move from the right side of the diagram. They seek similarities and general principles, and local calibrations are seen as variations rather than differences in kind. The overlap in the central positions is where the majority of geodesign projects can be found. This has important implications for the values and roles which are likely to dominate geodesign activities, and will profoundly influence education in geodesign, as I will discuss in chapter 11.

Both designers and scientists rely on models, on abstractions of the real world as they see it. Models can be used in three basic ways, for design, management, and assessment (figure 1.5). Such uses may be more aligned with one group over the other during a geodesign process.

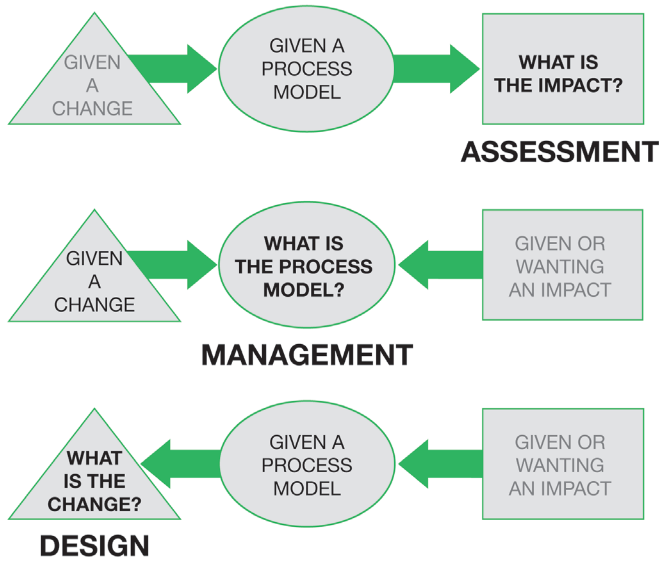


Figure 1.5: Models can be used in different ways; for assessment, management, or design. | Source: Carl Steinitz

Given a specified change and a given model, what is the impact? This is assessment and it may be more reliant on the geographical sciences.

Given a specified change and defining a desired impact, what is the model? This is management and it generally relies on the geographical sciences because it involves understanding and then manipulating the basic conditions and relationships within the model.

Given or defining a desired impact and given a model, what is or should be the change? This is the design of specified change, and it may rely more on the design professions. They tend to be more familiar with model content specific to the problem at hand.

The role of geodesign is especially important when scientifically derived models are under question. What if the process models are inadequate? This could mean a lack of data or bad data, insufficient understanding of the process for the particular context, a lack of predictive reliability, or a lack of cultural understanding in evaluation, as examples. Or, what if they are models of a process or context that have or require rapidly changing fundamentals, or a condition that defies precise definition? Or, what if they are faced with a completely new process? And what if the models are good ones *but* they forecast an unacceptable future? One still needs to make decisions and act regarding change. In such cases (which are not uncommon) one must "go beyond information given," and here there is an especially important need for collaboration in geodesign to link the design professions with the geographic sciences.

A symbiotic collaboration

Geodesign methods can already solve many problems that are generic, well defined, well understood, routine, and for which efficient models and algorithmic solutions already exist. These typically require a decision operation on a single GIS layer, although both the operation and the GIS layer may already be the result of much more complex models and analyses. An example might be finding the best location for a single point—assume it to be a building—in a GIS layer of the surface generated by a weighted index of several location criteria. Another might be finding the "least-cost path" between two points in a network for which each node and link is a value derived from traffic data.

However, most geodesign problems are much more complicated. They are *not* well defined, well understood, or routine. There are frequently no efficient existing algorithmic solutions that are sufficiently complex. It is almost impossible to develop the chains and networks of partial solutions a priori, and with any likelihood that they will generate satisfactory design solutions. This is an enormous challenge for geodesign. The complexity becomes even greater when one considers the need to evaluate design alternatives. It is a relatively easy task to take a design and to compare it to a map representing the result of an impact model. It becomes much more complicated when the impact model has spatial and temporal characteristics and simultaneously interacts spatially and temporally with several aspects of the design. The complexity is compounded when one is required to evaluate the impacts of the design across several models. Again, one can do this one model at a time. But what if it is recognized that the models themselves have interactions? And how does one build the impact models into a chain or network so that an impact on one triggers spatial and temporal impacts on the others? Because of these complexities, geodesign should not be defined as scientific ways of solving only spatial design problems in only spatial ways. Nor should it be defined as ways of solving (any) design problems in (only) spatial ways. From my perspective, geodesign should be defined as including ways of solving spatial design problems in any way and with any technology. This is my view and it forms the basic perspective of this book.

Furthermore, distinctions between "design" and "planning" should not be accepted in defining geodesign (regardless of how those terms are themselves defined). Seen from a distance and not from the reductionist academic world, design and planning are different names for the same thing and have much in common, as will be shown in following chapters. One shared aspect that dominates is that they both frequently demand "going beyond information given." Much of "the information given" may come from geography and other geographic sciences but some may not. The ability to "go beyond' is a human characteristic which we all share. It is not a characteristic of either data or technology. If this is not recognized, geodesign will be seen as applicable mainly in routine ways to "problems" that are already completely understood. This is possibly quite useful, and it is a capability of geodesign, but it is insufficient on its own.

It is the judgmental art of going beyond information given that makes geodesign a kind of "design." Models from the geographic sciences can make projections (up to a point) but if the projection points to "a problem," it requires a "what/where/when" solution that is *not* within the model. This is what challenges "designers" (in Herbert Simon's definition). Some of these designers will certainly be geographers and other scientists. But the designers also need the geography-based theories, methods and models to help shape the designs and also to assess the potential efficacy of proposed solutions. This mutual need is the basis for symbiotic, collaborative and successful relationships between the geographic sciences and the design professions, via geodesign, but it is not a full merger.

There is a paramount need for the collaborators in geodesign to find the appropriate balance between science and art. Again, paraphrasing Murray and Kluckhohn, to the extent that the study or project study area is like "all other places," the geographic sciences will likely dominate. Its theories and methods can reliably explain the present and project into the future, and algorithmic methods are more likely to produce good solutions. However, if the place is seen as being "like no other places," then science-based models are less likely to explain well or to produce satisfactory solutions. Here, inventive adaptation via experience-based ways of designing is more likely to succeed. This argues for accepting that geodesign is neither purely an art nor a science, but ultimately a judgmental art based on science. It requires the integrated contributions of both the design arts and the geographic sciences, which is not a wholly new endeavor.

Geodesign is not new[4]

I am not a historian. I am a landscape planner who looks toward the future, and who has years of collaborative experience in what I consider to be geodesign. Even so, I know that many of the ideas that have shaped my work are old ideas. In this book I will occasionally refer to and summarize examples which have influenced me and, I expect, others engaged in geodesign.

People have designed and changed the geography of their landscapes for thousands of years, often without the participation of design professionals or geographic scientists. A principal motivation was the production of food, especially in difficult terrain. The transformation from steep and rocky slopes to agriculturally productive terraces such as those in Yunnan Province, China, was accomplished over long time periods and primarily through trial and error, the “slow feedback” of many generations (figure 1.6). The many people contributing to this geodesign team are anonymous.

There is also a long history of major designed changes to geography. The West Lake of Hangzhou, China, is important for many reasons. It is the result of a decision made in the eighth century to design and build a very large lake next to the large city of Hangzhou. This landscape was made primarily for reasons of defense, water supply, aquaculture, and agriculture. In the Song Dynasty it was rebuilt under the direction of the poet and governor of Hangzhou, Su Shi (1037–1101). Causeways, islands, and the famous “Island in the lake on the island in the lake” were added by the geodesign team, the landscape and engineering designers, and hydrological and soils scientists of their day (figure 1.7). Hangzhou became the capital of China during the Southern Song Dynasty (1127–1279) and was then already a city of about a million people.

Over time, the West Lake has come to be considered a place of great scenic beauty and cultural importance (figure 1.8). Emperor Qianlong’s *Ten Scenes of the West Lake,* poems composed in the eighteenth century, are learned by all Chinese school children today. The West Lake is a landscape designed and built for practical reasons that has been transformed over time into a highly valued cultural landscape, and one that is often (and wrongly) assumed to have been created as the result of natural processes alone.

Warren H. Manning (1860–1938) worked for landscape architect Frederick Law Olmsted as a horticulturalist before establishing his own practice. By about 1910 electricity had become widespread, and light tables (drawing tables with translucent glass tops illuminated from below) were invented, initially to simplify the tracing of drawings. In 1912, Manning made a study that used map overlays as an analysis method, much as we often do today. He laid selected maps together to produce new combinations of information, and made a plan for development and conservation in Billerica, Massachusetts. Around this time, national maps of resource-based information for the United States were being produced and made available to the public for the first time. Manning collected hundreds of

Figure 1.6: Terraced agriculture: Yuan Yang, Yunnan Province, China. | Source: Shutterstock, courtesy of Barnaby Chambers.

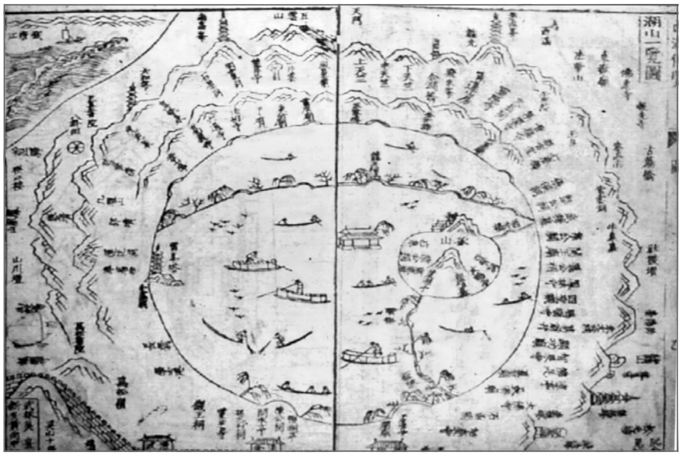


Figure 1.7: West Lake “plan of the lake and mountains.” | Source: Record of Fine Sights at West Lake (Xihu youlanzhi) by Tian Rucheng published in 1619.

Figure 1.8: The West Lake of Hangzhou, China.

national maps of soils, rivers and forests, and other geographic elements and had them redrawn to one scale (figure 1.9).[5]

By using overlays on a light table, he made a landscape plan for (what was then) the entire United States of America. It was published in *Landscape Architecture* in July of 1923 (figure 1.10).

Warren Manning's design contained a system of future urban areas and a system of national parks and recreation areas. It had the major highways and long distance hiking trails that we now have. It included everything that a comprehensive regional landscape plan undertaken via geodesign would have today. It is remarkable that Manning did this then, and for the entire country. It is one of the most important, bold, and creative designs in our professional history.

Organized academic and professional collaboration among scientists and design professions is also not a new idea. In 1969, Ian L. McHarg (1920–2001) published *Design with Nature.*[6] It is probably the single most influential book in the field of landscape planning. In it he outlined ways in which natural processes can guide development. The book includes several projects at several scales, each conducted by designers and scientists, many of whom collaborated for many years. The study I think is the most significant is the "Plan for the Valleys." In the 1960s, Baltimore was expected to expand into the area known as the Valleys. McHarg and his designer and scientist colleagues recognized that there were many possible patterns of development and studied four alternatives shaped by differing patterns of sewer alignments (figure 1.11). They knew that it was preferable to make several plans and compare them to help them pick the best. Development was not permitted on the bottomland so that productive agricultural land could be protected, and not on steep slopes or on hilltops. Instead expansion was distributed in compact groups on the gentler slopes and uplands. McHarg and his colleagues understood the beneficial relationships among landscape architecture, engineering, the geographical sciences, and planning for development. This was reflected in their highly collaborative and effective teaching, research, and professional practice.

I believe that geodesign cannot and should not become its own full-fledged design profession with depth and breadth, like architecture, landscape architecture, urban planning, and civil engineering. These established professions are already very

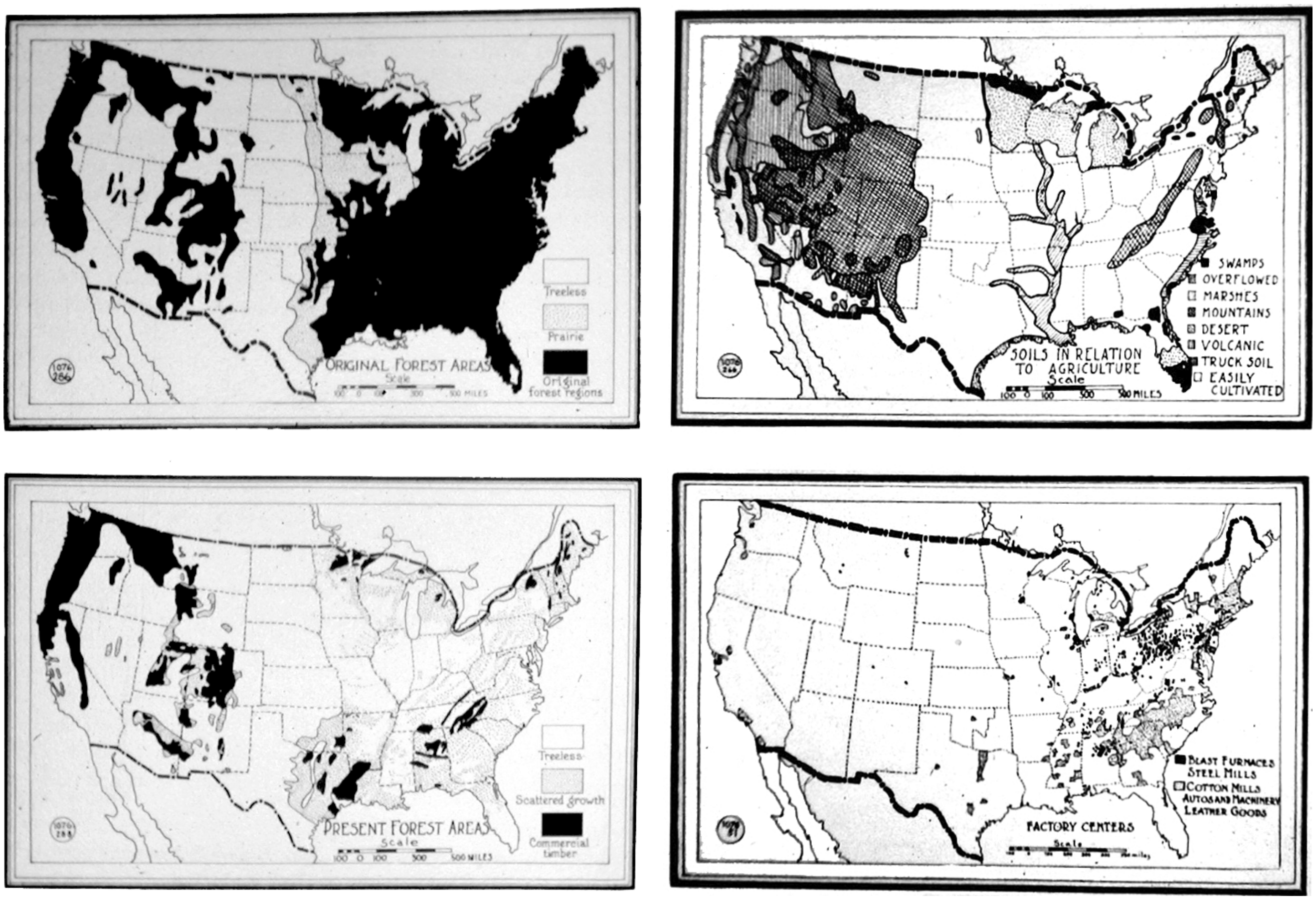


Figure 1.9: Four example overlay-maps of national data for the United States of America. | Source: C. Steinitz, P. Parker, and L. Jordan. "Hand Drawn Overlays: Their History and Prospective Uses." *Landscape Architecture* 66, no. 5 (1976): 444–55.