Applying the United States Secretary of the Interior's Guidelines for the Treatment of Cultural Landscapes to Digital Landscape Reconstructions

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ABSTRACT — *The London Charter for the Computer-Based Visualisation of Cultural Heritage (The Charter)* provides broad best-practice standards for digital reconstructions but also encourages the development of discipline-specific guidance. *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes* (*Guidelines*) details four preservation treatment strategies of physical cultural landscapes: preservation, restoration, rehabilitation, and reconstruction, or the re-creation of nonsurviving site features to interpret historic landscape character. It also acknowledges that reconstruction is the least common of the treatment strategies due to uncertainty, cost, risk to extant features, and other concerns. Digital reconstructions of cultural landscapes are increasingly seen as a viable substitute, but challenges due to the lack of discipline-specific standards and guidance remain. This paper examines the applicability of *Guideline's* reconstruction standards as the starting point for supplemental guidance to *The Charter. The Charter* focusses on the need for scholarly integrity and accommodates flexibility in both the purposes for reconstructions and the means for dealing with uncertainty, while *Guidelines* offers standards, steps, and examples that could prove particularly useful in the research, documentation, and modeling stages of cultural landscape digital reconstructions.

INTRODUCTION [1]

Reconstruction has long been seen as a valuable yet problematic preservation strategy in historic preservation and heritage conservation fields (Jameson 2004; Noble 2004). *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes* (hereafter *Guidelines*) describes reconstruction as "the act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose

of replicating its appearance at a specific period of time and in its historic location" (Birnbaum and Peters 1996, 128). *Guidelines* goes on to explain that, although reconstruction is one of four recommended preservation treatment strategies, "because of the potential for historical error in the absence of sound physical evidence, this treatment can be justified only rarely and, thus, is the least frequently undertaken treatment" (Birnbaum and Peters 1996, 130). Limited documentary evidence, high expense, inflexibility, possible ethical conflicts, and the potential disturbance of historic features and artifacts also contribute to the rare employment of this approach (Brush 2004; Jameson 2004). Conversely, however, reconstruction's noble promises of interpretation and education persist—along with more questionable motives such as entertainment, political capital, and economic gain—and continue to make the physical reconstruction of historic sites an attractive prospect (MacKintosh 2004; Noble 2004).

Since the 1980s the cultural heritage field has increasingly relied upon digital reconstructions of historic sites as a viable alternative to their physical counterparts (Frischer et al. 2000; Haegler, Müller, and Van Gool 2009). The recognized advantages of "virtual heritage" are many, including its ability to widely disseminate knowledge for public interpretation through the Internet, its usefulness for creating effective research aids that permit experts to explore multiple scenarios, its ability to be easily altered, and its comparatively low cost, to name a few (Brush 2004; Haegler, Müller, and Van Gool 2009). Challenges related to accuracy and authenticity remain and were even more pronounced as the rapid rate of technological improvements through the 1990s and early 2000s made it more and more possible to create increasingly realistic reconstructions, accompanied by the growing potential for misrepresentation (Denard 2013). Recognition of these risks prompted international calls for guidelines (Frischer et al. 2000; De Boer et al. 2011; Niccolucci et al. 2010; Remondino and Rizzi 2010), which were answered, at least in part, by the creation of *The London Charter for the Computer-Based Visualisation of Cultural Heritage* (hereafter *The Charter*), first published in 2005 and then amended in 2009. The primary purpose of *The Charter* is to "ensure that digital heritage visualisation is, and is seen to be, at least as intellectually and technically rigorous as longer established cultural heritage research and communication methods" (Dennard 2009). *The Charter* is inclusive of a wide range of fields and applications, and the guiding principles were purposely left broad but include the charge that "each community of practice, whether academic, educational, curatorial, or commercial, should develop London Charter Implementation Guidelines that cohere with its own aims, objectives and methods" (Dennard 2009). Hugh Denard, one of the authors of *The Charter* and its editor, elaborated on this point: "[sub]principle 1.1 of the Charter acknowledges the need for more detailed, discipline- and technology-specific implementation guidelines that map out the technical implications of these methodological principles" (Denard 2013).

Inspired by subprinciple 1.1, this paper explores the applicability of physical landscape reconstruction best practices spelled out in *Guidelines* to two digital reconstruction case studies. It should be noted that *Guidelines* is not much older than *The Charter*, having only been drafted in 1992 and published in 1996. *Guidelines* does, however, stem from longer established traditions of historic preservation of landscape and—especially—architecture (Allen 2007). The aim of this paper is not to establish cultural landscape guidelines for digital reconstructions, but rather to begin this discussion by examining accepted protocols for physical landscape reconstructions to see what they might have to offer, and where they fall short. For reference, below are listed *Guidelines*' six standards for reconstruction (Birnbaum and Peters 1996, 129) and *The Charter*'s six principles (Dennard 2009, 5–11).

Guidelines' Standards for Reconstruction

1. Reconstruction will be used to depict vanished or non-surviving portions of a property when documentary and physical evidence is available to permit accurate reconstruction with minimal conjecture, and such reconstruction is essential to the public understanding of the property.
2. Reconstruction of a landscape, building, structure or object in its historic location will be preceded by a thorough archaeological investigation to identify and evaluate those features and artifacts which are essential to an accurate reconstruction. If such resources must be disturbed, mitigation measures will be undertaken.
3. Reconstruction will include measures to preserve any remaining historic materials, features, and spatial relationships.
4. Reconstruction will be based on the accurate duplication of historic features and elements substantiated by documentary or physical evidence rather

than on conjectural designs or the availability of different features from other historic properties. A reconstructed property will re-create the appearance of the non-surviving historic property in materials, design, color, and texture.

5. A reconstruction will be clearly identified as a contemporary re-creation.
6. Designs that were never executed historically will not be constructed.

The Charter's Principles

1. Implementation: "the principles of the London Charter are valid wherever computer-based visualisation is applied to the research or dissemination of cultural heritage" (5).
2. Aims and Methods: "a computer-based visualisation method should normally be used only when it is the most appropriate available method for that purpose" (6).
3. Research Sources: "in order to ensure the intellectual integrity of computer-based visualisation methods and outcomes, relevant research sources should be identified and evaluated in a structured and documented way" (7).
4. Documentation: "sufficient information should be documented and disseminated to allow computer-based visualisation methods and outcomes to be understood and evaluated in relation to the contexts and purposes for which they are deployed" (8).
5. Sustainability: "strategies should be planned and implemented to ensure the long-term sustainability of cultural heritage-related computer-based visualisation outcomes and documentation, in order to avoid loss of this growing part of human intellectual, social, economic and cultural heritage" (10).
6. Access: "the creation and dissemination of computer-based visualisation should be planned in such a way as to ensure that maximum possible benefits are achieved for the study, understanding, interpretation, preservation and management of cultural heritage" (11).

INTRODUCTION TO CASE STUDIES

The two case studies referenced in this paper were digital reconstructions undertaken by the authors, staff from the University of Arkansas Center for Advanced Spatial Technologies (CAST), and undergraduate University of Arkansas students engaged in service-learning projects in two historic landscape preservation courses (in 2014 and 2016). For both the Rohwer Relocation Center in Rohwer, Arkansas, and the Hicks site in Rush, Buffalo National River, Arkansas, digital reconstruction was undertaken as a way to increase public understanding of valuable historic resources for sites with few extant features, low levels of landscape integrity, and limited interpretive features.

The Rohwer Relocation Center was one of two Japanese American internment camps located in Arkansas during World War II. Rohwer opened in September 1942, and shortly thereafter the internee population of the camp peaked at 8,475. The residential core of the camp was one square mile in area, modeled after a typical army barracks, and surrounded by a barbed wire fence and guard towers. Internee housing was located on thirty-three residential blocks, each 500 feet square and containing twelve tar-papered barrack buildings, a communal mess hall and kitchen building, a latrine and laundry building, and a public service hall for assorted civic activities. When the internees first arrived they faced monotonous rows of identical barracks, spartan apartments, and dusty grounds largely devoid of vegetation. They immediately began to modify their surroundings to improve their quality of life, however, improvising furniture, building porches, arbors, and other shade structures, and planting gardens. A newspaper editorial later recalled that "Rohwer in its heyday looked like a cross between a concentration camp and a museum garden; seldom has so much to gratify the senses been created out of so little" (*Pine Bluff Commercial* 1961). After the war ended and Rohwer closed in late 1945, most of the buildings were auctioned off and relocated, and by the late 1940s much of the land had been converted to private agriculture. Today's visitors find cotton fields; very few physical remnants remain to tell the story of the site's past (Figure 1).

The same can be said about the Hicks site in Rush, Arkansas. This ten-acre property is located at the center of the Rush Historic District—a former mining community with a population that peaked at 2,000 to 3,000 during World War I—nestled in a narrow Ozark mountain valley along the Buffalo River. Booms and busts in the zinc market during the late 1800s and early 1900s quickly built and ultimately decimated Rush. The Hicks family settled in Rush in 1903 and rapidly became ingrained as prominent members of the community, maintaining

Fig. 1. Panorama of an Arkansas cotton field that during World War II was the residential core of the Rohwer Relocation Center, 2012. (Photograph by Kimball Erdman.)

a livery service, a hotel, and a general mercantile and gaining a reputation as "one of the most prosperous merchants in North Arkansas" (*Mountain Echo* 1915). Site improvements, such as a 240-foot-long fieldstone retaining wall fronting the property, geometric pebble-and-concrete-lined flower beds arranged on a front lawn, and a brick-paved front walk reinforced the impression of the family's prosperity and permanence in a transient community. By the late 1920s, however, financial troubles stemming from the departure of most of the mining outfits forced the store and hotel to close. By the early 1940s the last members of the family had either died or left. By the 1950s Rush was being promoted as a ghost town by the county to encourage tourism. It was also during this time that the former Hicks Hotel was destroyed by fire and the vacant two-story stone store was significantly modified and converted to serve briefly as a single-story residence. The Buffalo National River was established in 1972 and the remnants of Rush were incorporated a short time later, but the Hicks site continued to deteriorate. Today's visitors pass the retaining wall en route to Rush Landing, a popular access point on the Buffalo River. Some stop and scramble through the young forest that has reclaimed the Hicks property to explore the partial stone walls of the former store and the low concrete-and-pebble curbs of the flower beds, but few are able to grasp the site's former character or comprehend its history (Figure 2).

APPROACH

Guidelines identifies six steps that should be taken to meet reconstruction standards: (1) research and document historical significance; (2) investigate archaeological resources; (3) identify, protect and preserve extant historic features; (4) reconstruct non-surviving landscapes; (5) interpret the reconstructed landscape; and (6) address accessibility considerations/health and safety considerations/environmental considerations and energy efficiency (Birnbaum and Peters 1996, 131). The body of this paper is organized by the first five steps, with each section exploring the applicability of a particular step to the digital reconstruction case studies and *The Charter*. Step 6 deals with concerns that apply only to physical reconstructions and therefore will not be addressed.

1. Research and document historical significance

Guidance for the treatment Reconstruction begins with researching and documenting the landscape's historical significance to ascertain that its re-creation is essential to the public understanding of the property. Often, another extant historic landscape on, or near the property, can adequately explain the property, together with other interpretive aids. Justifying a reconstruction requires detailed physical and documentary evidence to minimize or eliminate conjecture and ensure that the reconstruction is as accurate as possible. Only one period of significance is generally identified; a landscape, as evolved, is rarely re-created. During this important fact-finding stage, if research does not provide adequate documentation for an accurate reconstruction, other interpretive methods should be considered, such as an explanatory marker. (Birnbaum and Peters 1996, 131)

Historical research, definition of significance, and the importance of documentary and physical evidence described in this step are equally applicable to physical and digital reconstructions and coincide with *The Charter*'s Principle 3, although *Guidelines* describes the process in greater depth. Importantly, the concept and importance of reconstructing to a "period of significance," which is also relevant to digital reconstructions, is only

Fig. 2. View from atop an opposing bluff of the former Hicks Hotel and Store site in the former zinc-mining community of Rush, Arkansas, now part of the Buffalo National River, 2016. (Photograph by Kimball Erdman.)

addressed by *Guidelines*. That being said, digital reconstructions do offer a distinct advantage over their physical counterparts through their ability to convey the passage of time—more than one period of significance can be portrayed if need, resources, and documentation exist (Zuk, Carpendale, and Glanzman 2005). Another point stressed in *Guidelines* but not in *The Charter* is the charge to not proceed with reconstruction if sufficient evidence cannot be found. This may be due in part to the ability of digital reconstructions to employ a greater range of methods to deal with uncertainty, but the need to alter or even abandon a reconstruction effort due to insufficient historic documentation certainly still applies. Instead, *The Charter* emphasizes the importance of selecting the appropriate method in Principle 2, but it does not explicitly tie method selection to the availability of evidence. Rather, it only bases the choice of visualization method on a vague "evaluation of the likely success of each approach in addressing each aim" (Dennard 2009, 6).

Both case studies began with extensive research to discover and gather secondary and primary source material, including maps, plans, specifications, photographs, paintings, film, newspaper articles, correspondence, oral histories, autobiographical accounts, records, reports, journal articles, and books. Materials deemed relevant to the projects were collected, sorted, and indexed based on content depiction.

The Rohwer project team initially hoped that a full recreation of an actual residential block would be possible due to the unusually high volume and quality of historic documentation we were discovering. Copies of the original 1942 construction documents were obtained, along with drawings, work summaries, and construction history reports recording all changes between 1942 and 1945. In contrast, however, very few of the substantial alterations made by internees to their interior and exterior environments were recorded in detail in the official construction histories, but a vast assortment of primary sources describe the creative and ingenious efforts of internees to make their stark living conditions more bearable.

As we completed the research phase at Rohwer several challenges became evident. To begin with, many

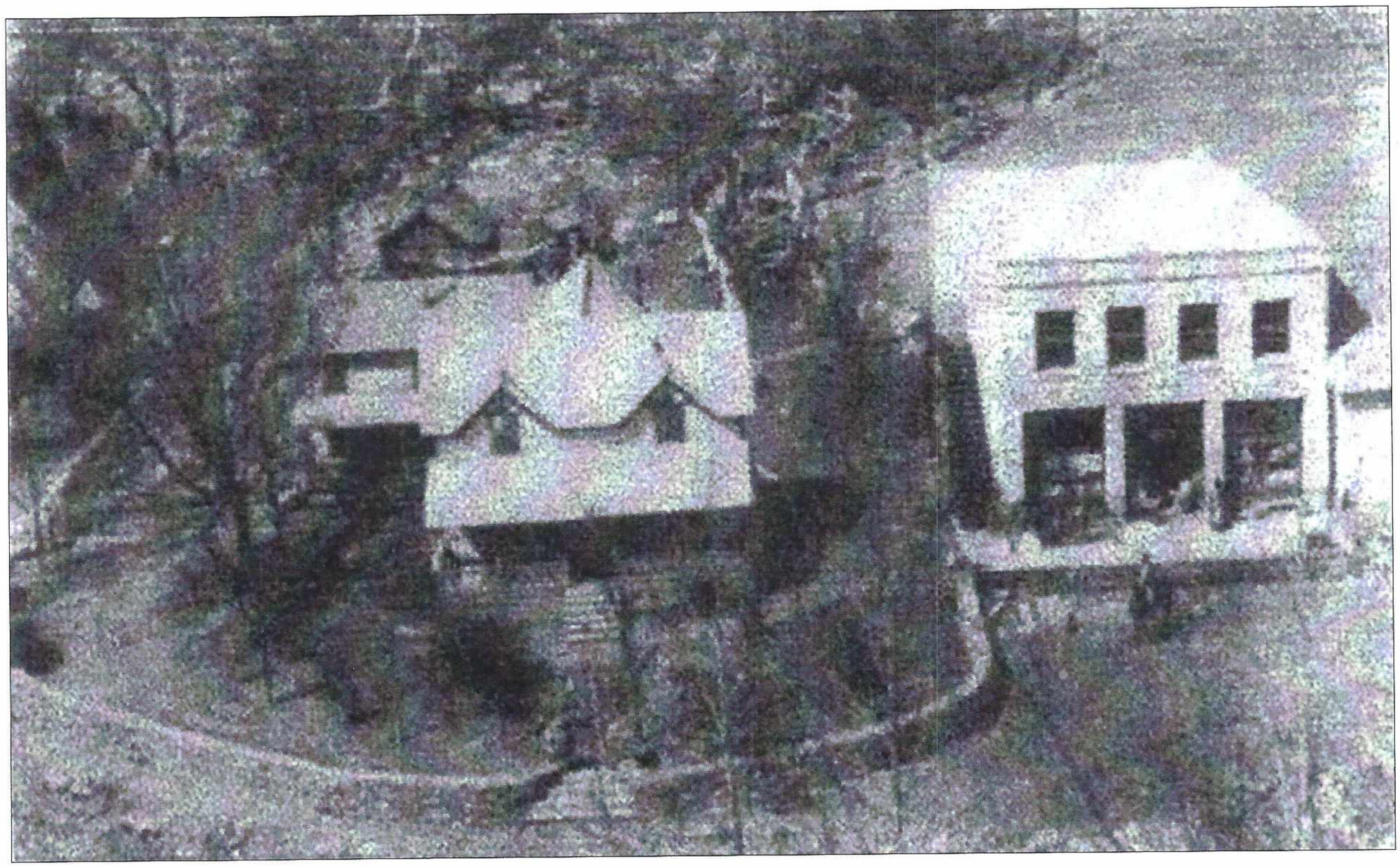

Fig. 3. Historic photograph of the Hicks Hotel (left) and Store, c. 1918. (Courtesy of Buffalo National River.)

photographs and films lacked metadata or contextual clues to indicate which residential block they were taken in, making it difficult to accurately flesh out the camp skeleton provided by the historic drawings. In addition, many photographs were of limited usefulness as they did not depict the correct time period. Even though the camp was only occupied for a few years, there were rapid and substantial changes as internees settled into their surroundings. Summer 1944 was selected by the project team as the period of significance and target date for the reconstruction as that period represented the fully developed and fully occupied camp at the peak of internee intervention; 1943 was an establishment year, with parts of the camp still under construction, while during 1945 the principal focus of the War Relocation Authority shifted from retention to relocation, resulting in the rapid reduction of the internee population and a corresponding decline in the physical appearance of the camp. Based on these discoveries, we concluded that we did not have sufficient graphic coverage to reconstruct any specific block in its entirety with certainty, and therefore an alternative approach (which will be described in Step 4) would have to be found.

The availability of source material for the Hicks project proved quite different but equally challenging. No historic drawings of the buildings or site were found, but mapping was facilitated by a 1939 orthophotograph and an archaeologists' report (Stratton and Mansberger 2005). Only four other historic photographs of the site were found during our research. Not surprisingly, these photographs featured the Hicks Hotel and Hicks Store, the two most prominent and significant structures on the site. An undated oblique aerial photograph depicting the front (south) facades of the hotel and store, taken from atop the high bluff on the opposing side of the narrow valley, proved to be the most critical, even though it captured the property just prior to the peak of the period of significance, which was determined by the project team to be the early 1920s (Figure 3). Several outbuildings were also visible in this image. A second undated photograph showed the west side of the hotel in the 1930s, not long after the hotel had closed. Two more historic photographs provided close-up details of the hotel porch and the stone retaining wall, but that was the extent of historic graphic evidence we had to work from. Newspaper articles, autobiographical accounts, oral histories, and archaeological

evidence provided additional information concerning other important areas of the Hicks-era landscape, including the livery barn and cattle dip, the Hall house, and rental houses owned by the Hicks family on the south side of Rush Creek, but none of these materials were descriptive enough to allow us to model beyond the area depicted in the historic photographs with sufficient confidence.

In conclusion, *Guidelines* provided useful, discipline-specific guidance for this step, even though some of the limitations placed on physical reconstructions were not necessarily applicable. We found *Guidelines*' recommended practice of "researching and documenting the property's historical significance, focusing on the availability of documentary and physical evidence needed to justify reconstruction of the non-surviving cultural landscape" to be essential but challenging (Birnbaum and Peters 1996, 134). Significant uncertainties remained in both case studies that, based on the strong caution issued by *Guidelines* (but not *The Charter*), called the appropriateness of reconstruction into question. The remaining steps will explain the techniques we adopted to adhere as best we could to recommendations in *Guidelines* and portray the sites as authentically as possible while limiting conjecture.

2. Investigate Archaeological Resources

Investigating archaeological resources is the next area of guidance in the treatment Reconstruction. The goal of physical research is to identify spatial organization and land patterns, features, and materials of the landscape which are essential to an accurate reconstruction, while leaving those archaeological resources that are not essential undisturbed. Resources that are not relevant to the project should be preserved in place for future research. The archaeological findings and archival materials are then used to document the reconstruction period. (Birnbaum and Peters 1996, 131)

Digital reconstructions of cultural landscapes are often undertaken by archaeologists or by others who have access to their work, such as we did for the Hicks property. Archaeology can yield valuable data that clarifies or adds to documentary evidence. Archaeology is not singled out in *The Charter*, but its value is inferred from the definition of research sources as "all information . . . considered during, or directly influencing, the creation of computer-based visualisation outcomes" (Dennard 2009, 7). As mentioned previously, digital reconstructions offer an advantage in that the re-creation process will not jeopardize archaeological resources. While Step 2 makes sense as best-practice guidance for both physical and digital reconstructions, there can be exceptions. At Rohwer, we faced the unusual situation of having a very large quantity of high quality historic documentation but the potential for very limited archaeological information at Block 12 due to construction methods, the short period of occupation, and the deliberate removal of camp features followed by decades of intensive agriculture. Because of this situation we determined an archaeological investigation would not yield data sufficient to influence the digital reconstruction. Other situations exist where extensive archaeological research may not be feasible or necessary, such as the digital reconstruction of a large rural landscape where the goal is to create the impression of historic character, and the appropriate method of reconstruction is selected accordingly (De Boer, Voorbij, and Breure 2009).

3. Identify, Protect and Preserve Extant Historic Features

Closely aligned with archaeological research, recommendations are given for identifying, protecting, and preserving extant features of the cultural landscape. It is never appropriate to base a Reconstruction upon conjectural plans or designs, or the availability of different features from other landscapes. Thus, any remaining historic features and materials, such as remnants of a foundation, walkway or pond, should be retained, when practical, and incorporated into the reconstruction. The historic as well as new material should be carefully documented to guide future research and treatment. Such documentation could include photographs, measured drawings, and work specifications. (Birnbaum and Peters 1996, 131)

Identifying extant historic features through field reconnaissance to verify documentary evidence is important for both physical and digital reconstructions. As with Steps 1 and 2, site observation is not prescribed in *The Charter* but would also fall under Principle 3: Research Sources. Step 3 can be valuable even when a landscape has been so severely altered that few historic features remain. As mentioned previously, almost all historic traces of Rohwer's Block 12 had been obliterated, but we did discover that the north and east roads that bounded the block remained as field access roads and their associated drainage swales also remained. We also found contextual evidence in the surrounding camp landscape. For example, the view north from Block 12 to the tall boiler-house chimney, one of very few remnants from

the interment period, some two-thirds of a mile away on the north boundary of the camp core is today blocked by a woodland, but this landmark can be clearly seen from the adjacent field, a fact that we were able to incorporate into the visualization. In contrast, much more physical evidence remained at the Hicks site, so we decided to formalize the documentation process by completing HALS (Historic American Landscapes Survey) documentation consisting of a detailed report, photographs, and measured drawings of existing site conditions (Erdman 2016). While this intensive level of documentation is not required by *Guidelines*, it does facilitate the first three steps of the reconstruction process while also creating a public record for future reference and interpretation.

The other parts of Step 3 have limited relevance to digital reconstructions. Protection and preservation of extant historic features is not essential since the landscape is not modified during the digital reconstruction process (although digital reconstruction can help raise awareness of a site and the need to preserve it). In addition, the admonition to "never . . . base [physical] Reconstruction upon conjectural plans or designs" is not echoed in *The Charter*. To the contrary, *The Charter* states that hypothetical reconstructions are acceptable provided factual uncertainties are disclosed (Dennard 2009, 8). As discussed previously, the ability to model uncertainty and hypothetical alternatives, which is acceptable if methods are documented and disseminated (see Step 5), is one of the reasons digital reconstruction may be selected over physical reconstruction.

4. Reconstruct Non-Surviving Landscapes

After the research and documentation phases, guidance is given for Reconstruction work itself. Features are addressed in general, always emphasizing the need for an accurate depiction; for example, exact duplication of field patterns or installation of a perennial border with exact arrangement and same genus, species and cultivar plants. In the absence of extant historic materials, the objective in reconstruction is to re-create the appearance of the historic landscape for interpretive purposes. Thus, while the use of traditional materials and finishes is always preferred, in some, instances, substitute materials may be used if they convey the same visual appearance. (Birnbaum and Peters 1996, 131)

The procedure identified by *Guidelines* for the reconstruction of non-surviving landscapes emphasizes two seemingly intuitive points: (1) reconstructed features should accurately maintain their historic appearance, and (2) inadequately documented features should not be reconstructed (a point not made in the Step 4 summary quoted above but reiterated repeatedly in subsequent illustrative examples—see Birnbaum and Peters 1996, 134–37). *The Charter* does not identify similar requirements, but instead implies that speculation is both common and acceptable in digital reconstructions. Principle 2: Aims and Methods most closely aligns with Step 4, and it addresses the selection process of the most appropriate modeling strategy. Some of the methods listed in subprinciple 2.3 are among those commonly used to deal with uncertainty, including non-photorealism, transparency, coloration, procedural modeling, and the like (Daniels-Dwyer 2004; Haegler, Müller, and Van Gool 2009; Roussou and Drettakis 2003; Zuk, Carpendale, and Glanzman 2005). *The Charter* does make it clear that documentation and interpretation of the selected method(s) is essential (this will be discussed in Step 5), but for our discussion of Step 4 we will focus on the methods employed in our case studies to balance *Guidelines*' call for accuracy of appearance (which is not a requirement of *The Charter*) with *The Charter*'s flexibility in dealing with limited historic documentation.

With the research phases complete for both projects, the next principal task was to create detailed two-dimensional period plans in AutoCAD of what was to be modeled. In the case of Rohwer, the completed period plan of a residential block was sent to CAST staff for the creation of three-dimensional structures, furnishings, and other objects in SketchUp, Maya, and Softimage. Modeled components were then imported into Unity, a game engine that was used to model vegetation and facilitate user interaction. Like Rohwer, the Hicks project utilized AutoCAD, SketchUp, and Unity, but students were to create the digital reconstruction under the tutelage of CAST staff.

As noted in Step 1, we had ruled out the possibility of recreating an actual block at Rohwer due to insufficient documentation. This problem actually granted us the freedom to choose which block would be best to use as our starting point. Most of the camp's residential blocks were completely devoid of vegetation when internees arrived in the fall of 1942. Ten full blocks and two half blocks in the southwest corner of the camp had only been partially logged of their original hardwood forest, however, leaving some large trees to shade the barracks. In order to demonstrate both conditions we settled on reconstructing Block 12, one of two blocks that was half wooded. An accurate layout of Block 12 buildings,

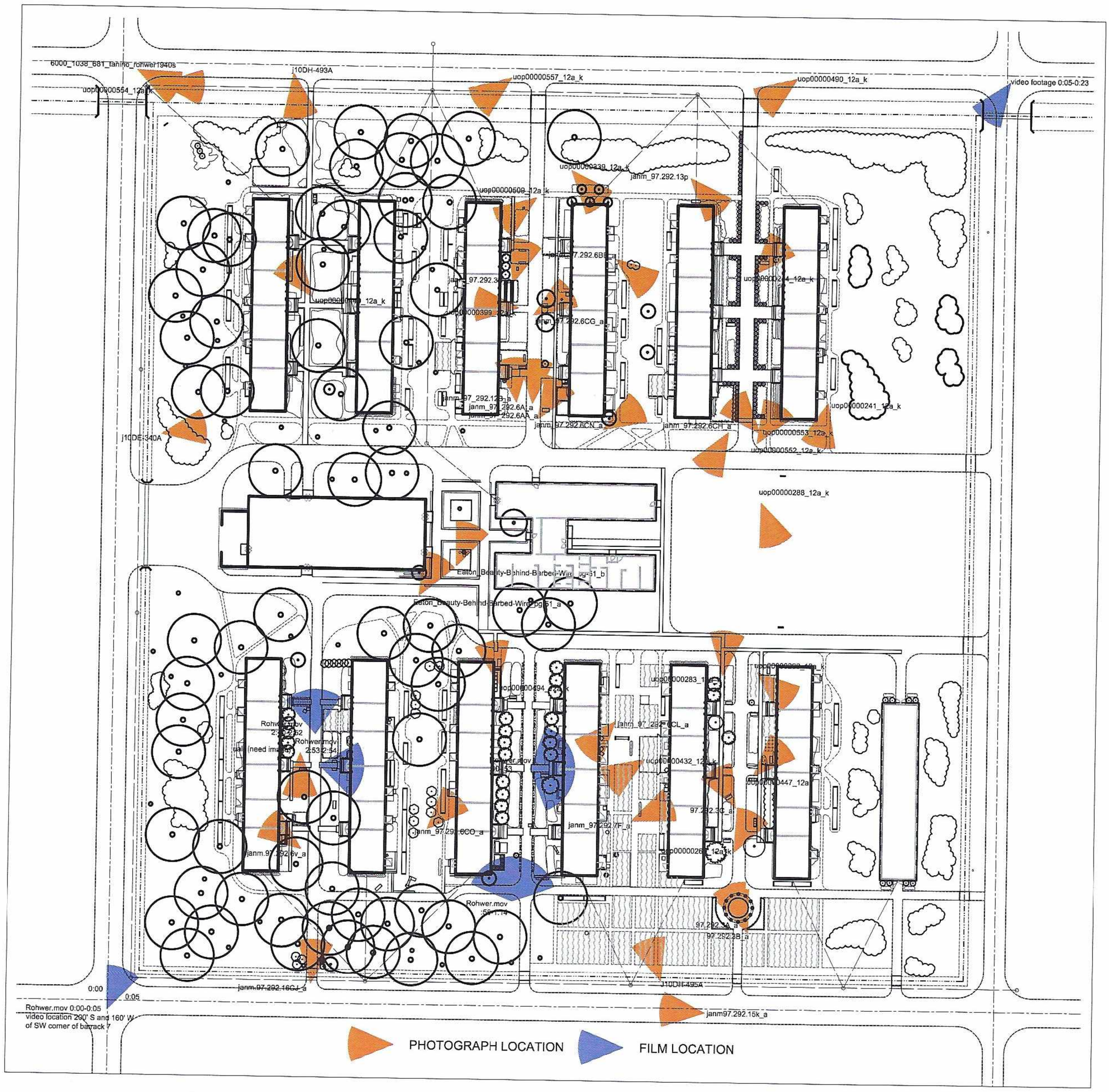

Fig. 4. Map of visual historic documentation of Rohwer that contributed to the creation of the period plan and digital reconstruction. (Map by Kimball Erdman.)

drainage swales, and power lines, as well as the views to adjacent blocks, was achievable because we had access to the historic construction documents.

Fleshing out the base map for Block 12 in a way that accurately portrayed the lived-in character of the camp was facilitated by the repetitive quality of the camp landscape. While we did not have sufficient evidence from a single block for the reconstruction, we determined that we had enough documentation from throughout the camp to combine these sources in a way that would capture the representative character a typical block and still conform to *Guidelines* standards. Common landscape features in the residential blocks included victory gardens (small-scale vegetable gardens that first became popular in America during food shortages of World War I and were seen as a way everyday citizens could contribute to a patriotic cause), flower gardens, lawns, shrubs, small trees, porches, arbors, trellises, benches, boardwalks,

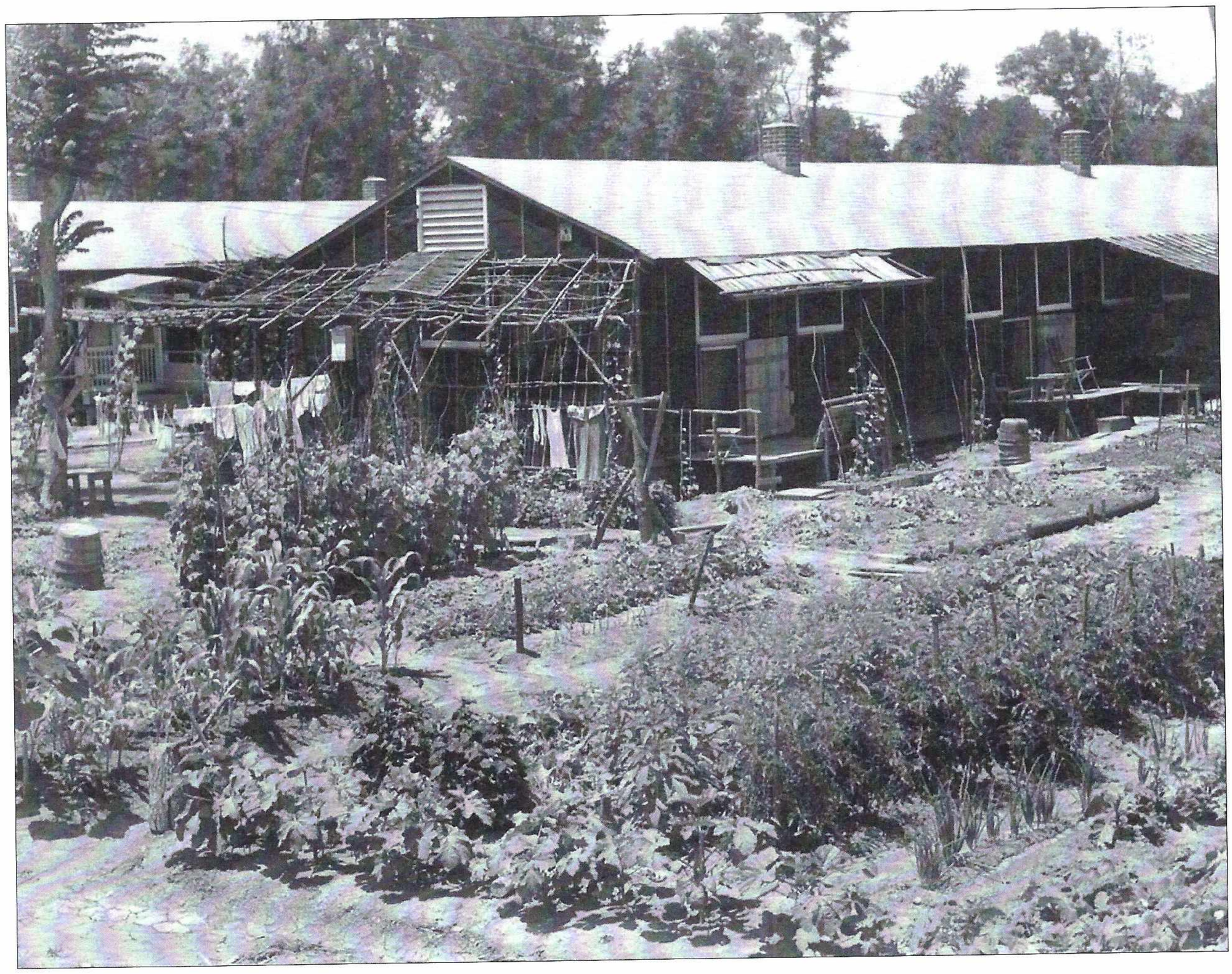

Fig. 5. War Relocation Authority photograph of a victory garden at Rohwer. (Courtesy of National Archives.)

gravel paths, clotheslines, woodpiles, and the like. All imagery of exterior spaces was screened and sorted through the following process:

1. All imagery had to be from Rohwer (the Jerome Relocation Center was located about forty miles away and exhibited similar character to Rohwer, but we felt inclusion of Jerome imagery was toogreat a departure from the *Guidelines* recommendations).
2. All imagery had to be from the residential blocks and not other areas of the camp.
3. All imagery had to show sufficient landscape detail, depict the summer season, and appear to date from 1944 or 1945, based on an assessment of the maturity of vegetation (unless the primary subject of the image was a structure or object).
4. Imagery was sorted by wooded or non-wooded character (the west half of Block 12 was wooded, the east half was not).
5. Imagery was sorted by location within the typical block spatial organization; imagery that was not identifiable by location was not used.
6. Imagery was sorted by visual compatibility to create cohesiveness within exterior spaces, and to also create as much coverage as possible within these spaces.

Each exterior space was then assigned to a student. Source imagery was mapped as accurately as possible by marking the position, orientation, and viewing angle of the photographer or videographer on the preliminary base map (Figure 4). The locations of objects, paths, structures, and vegetation depicted in each source were

Fig. 6. Digital reconstruction of Figure 5. (Courtesy of the Center for Advanced Spatial Technologies and Fay Jones School of Architecture + Design, University of Arkansas.)

then interpolated and added to the base map. Even with the approach of employing graphic sources from all residential blocks there were still gaps in coverage. Areas that were not depicted in photographs or film were then designed and drawn on trace paper based on the patterns and character established by adjacent historic imagery. The drawing of each exterior space was then reviewed and revised for accuracy before being drafted on the base map in AutoCAD. Image source, position, orientation, and view angle were also recorded in AutoCAD to guide the CAST modeling team. The end result was a historic character derived from a collection of reconstructed scenes from throughout the camp, combined with interpreted intermediary spaces, in keeping with *Guidelines* definition of historic character as "the sum of all visual aspects, features, materials, and spaces associated with a cultural landscape's history" (Birnbaum and Peters 1996, 8) (Figures 5 and 6).

During the modeling process for Rohwer, standard and custom material libraries were drawn upon when suitable, but many unique and well-documented features, including interior and exterior furniture, stoves, and select plant materials, were created specifically for this project. For example, *Fatsia japonica* (Japanese aralia) was popular among internees, possibly because of its rapid growth and the shade it created. Its large leaves and tropical appearance made the plant very distinct, and since a suitable substitute was not available in ready-made libraries a new model of the plant was created. In addition, two- and three-dimensional scans of actual Rohwer artwork, photographs, sculptures, and furniture were utilized in the model interior of a barrack apartment.

As at Rohwer, it was necessary to create a period plan of the Hicks property following the research phase to guide the modeling process. The resulting period plan depicted the most detail and certainty in the areas west and south

Fig. 7. Digital reconstruction of Figure 3, supplemented by information gleaned from fieldwork and historic documentation. Buildings lacking detailed historic documentation are rendered in transparent gray to indicate uncertainty. (Courtesy of Fay Jones School of Architecture + Design and the Center for Advanced Spatial Technologies, University of Arkansas.)

of the hotel and store, along Rush Road. We mapped approximate locations of other structures on the ten-acre property (the livery barn, Hall house, rental houses, etc.), but had no other documentation besides the 1939 aerial (in which only the Hall house is visible) and a few written and verbal descriptions.

The Hicks site at Rush lacked not only the wealth of visual documentation found for Rohwer but also the repetitive landscape pattern that made the approach we selected for Block 12 possible. The features which we had the most documentation for, the hotel and store buildings, were modeled first, although interiors were not modeled due to insufficient evidence. The landscape was modeled next, based largely on physical remnants: the stone retaining wall, brick walk, concrete-and-pebble flower beds, concrete steps and store porch, and even the extant daffodils and roses that may be descendants of plants originally planted during the period of significance. Other details were gleaned from written accounts and oral histories. For example, we learned the hotel was painted white and had barrels in the front yard containing fresh water piped in from the base of a waterfall across the road and creek. Photographs revealed that two outbuildings sat behind the hotel, that the original gates in the retaining wall were iron, that the store had advertisements pasted in the windows, and that a frame swing sat on the store's porch; all of these details were modeled.

Character-defining features that could be modeled with certainty were given realistic textures that conveyed the historic materiality. Buildings that were not clearly understood but that are visible in the reconstruction were modeled as "ghost" structures (an acceptable *Charter* method): simple, without detail, and with a transparent grey texture to clearly communicate to site visitors the lack of information about these buildings (Figure 7).

5. Interpret the Reconstructed Landscape

An integral component of Reconstruction is to make clear to the visiting public that the landscape is not authentic; rather, it is a portrayal of the past for interpretive purposes. Thus, the Standards for Reconstruction make clear that the need to identify the treatment through signs, markers or other interpretive tools. Often, a brochure explaining a landscape's history will note its

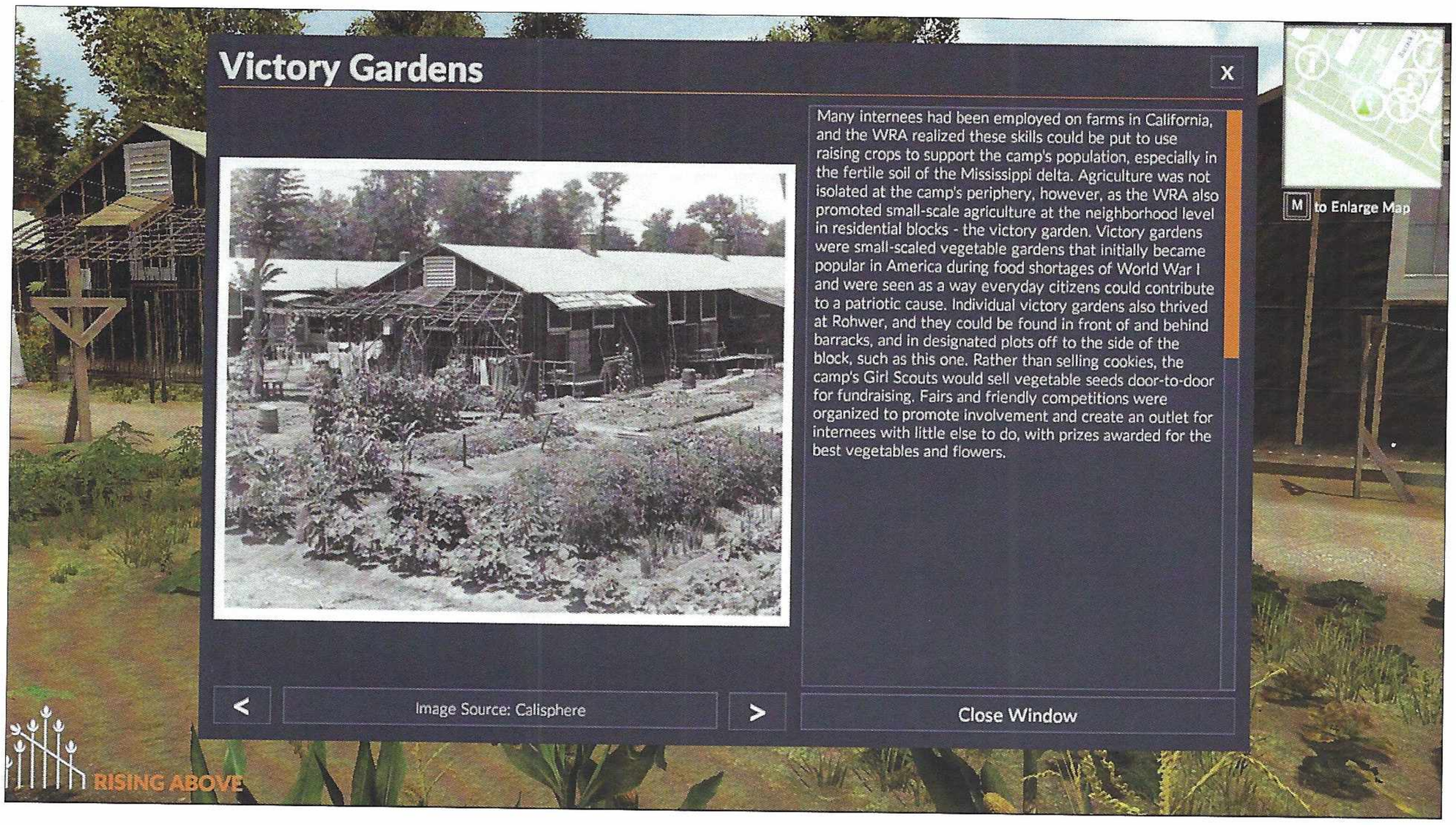

Fig. 8. The Unity interface allows for the Rohwer reconstruction to be interpreted with the primary source documentation that facilitated modeling. (Courtesy of the Center for Advanced Spatial Technologies and Fay Jones School of Architecture + Design, University of Arkansas.)

disappearance over time and subsequent reconstruction--and interpreters also offer background so that visitors can understand what they are viewing. (Birnbaum and Peters 1996, 131)

The importance of Step 5 is shared and greatly emphasized by *The Charter* in Principle 4: Documentation, which devotes twelve points to understanding and interpreting the modeling methods employed (whereas the other five principles have only two to four points each—this is likely related to the fact that digital reconstructions allow for more uncertainty, and therefore decisions that affect accuracy have to be documented). Principle 4 is divided into seven sections aimed at maintaining scholarly integrity: enhancing practice, documentation of knowledge claims, documentation of research claims, documentation of process, documentation of methods, documentation of dependency relationships, and documentation of formats and standards (Dennard 2009, 8–9). Although the focus of this paper is on what *Guidelines* can offer *The Charter* in terms of supplemental, discipline-specific standards, it seems that Step 5 of *Guidelines* would be significantly enhanced by adopting *The Charter*'s Principle 4 protocols. In keeping with both sets of standards, a detailed methodology was made publicly available for both case studies on their respective websites, along with interpretive strategies described in the following paragraphs.

For Rohwer, a summary of the process used to create the model is also described at the beginning of the guided tour. Visitors are permitted to either experience a portion of Block 12 on a prescribed tour or explore the entire block on their own. In both tour options visitors are introduced to a series of interpretive stops, or digital signposts, that feature the historic imagery that was used to build each scene (Figure 8). This allows visitors to compare the imagery to the digital reconstruction. The signposts also feature relevant quotes from primary written sources, including newspaper articles, reports, and similar materials, that are supplemented with commentary to explain the key character-defining features at the various stops.

As previously noted, we determined that it would not be possible to digitally reconstruct the entire Hicks site due to lack of historic documentation and repetitive qualities as exhibited at Rohwer. Unlike the Rohwer reconstruction, where the user has the freedom to explore the Block 12 landscape at will within the Unity platform, the Hicks experience needed to be tightly controlled since most of the contextual landscape of the Hicks site was

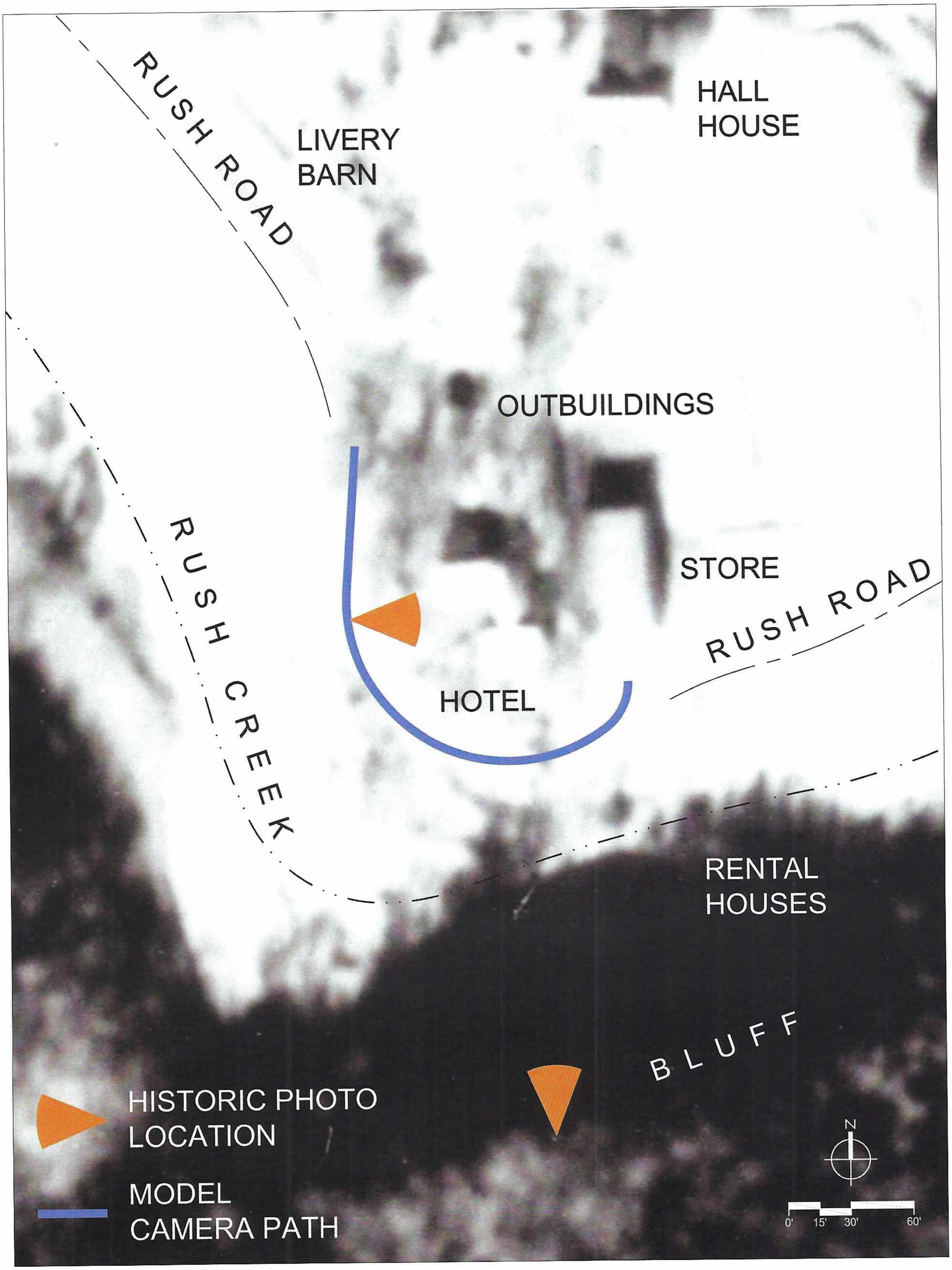
RUSH ROAD
LIVERY BARN
HALL HOUSE
OUTBUILDINGS
STORE
RUSH ROAD
HOTEL
RUSH CREEK
RENTAL HOUSES
BLUFF
HISTORIC PHOTO LOCATION
MODEL CAMERA PATH
N
0'
15'
30'
60'

Fig. 9. (opposite page) Limited documentation led to a partial reconstruction of the Hicks site, consisting of a video shot along the blue path (Rush Road) and two historic photograph reproductions. The 1938 aerial photograph in this map was one of five historic images used to create the model. (Map by Kimball Erdman.)

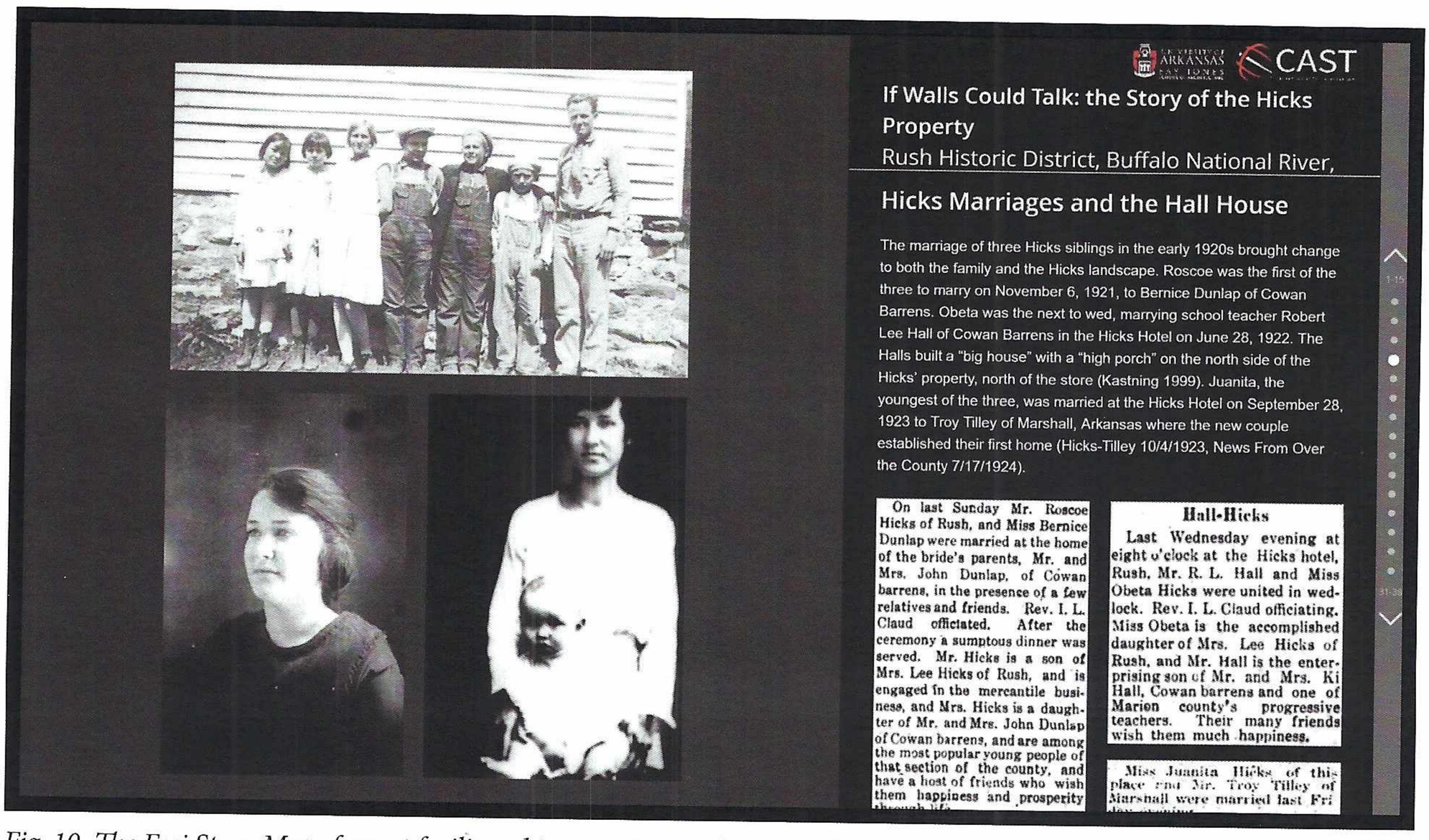

Fig. 10. The Esri Story Maps format facilitated interpretation of aspects of the Hicks site history that could not be modeled. (Courtesy of Fay Jones School of Architecture + Design and the Center for Advanced Spatial Technologies, University of Arkansas.)

conjectural. It was anticipated that the digital reconstruction for the Hicks project would reside in and be accessed using Esri Story Maps, so we decided these less-well-documented areas of the landscape would be best interpreted through written narrative and the inclusion of primary sources in the story map alone, rather than through a speculative model. The reconstruction strategy we settled on for the Hicks site was to recreate the experience of traveling along Rush Road in the early 1920s as it curved around the west and south sides of the hotel and store (Figure 9), exposing visitors to the historic route most would have traveled during the period of significance. This strategy focuses visitors on the portion of the landscape with the most documentation, and subsequently the greatest amount of certainty, and eliminates the need to model less-understood areas of the Hicks property. Instead of visitors accessing the digital reconstruction using the Unity interface, as with Rohwer, video of the prescribed route was exported from Unity and imported into Esri Story Maps. This strategy greatly limited user interaction with the digital reconstruction but avoided the potential for misinterpretation. Interpretation of the less-well-known areas such as the livery barn and Hall house was still possible through narrative text, imagery, and audio clips of oral histories in the Esri Story Maps format (Figure 10).

FINDINGS

Both *Guidelines* and *The Charter* have significant value for the digital reconstruction process, but they also have shortcomings. *The Charter* was born out of "the necessity of guaranteeing a transparent production," which explains the emphasis on Principle 4: Methods (Niccolucci et al. 2010, 1). Principle 5: Sustainability and Principle 6: Access have limited direct applicability to physical reconstructions and consequently do not

have an equivalent in *Guidelines* and are therefore not addressed in this paper. This is an area where *Guidelines* fundamentally falls short of the needs of digital products, and Principles 4, 5, and 6 must be addressed when discipline-specific guidelines for digital reconstructions are developed. Conversely, *Guidelines* is much more prescriptive than *The Charter* in terms of research, authenticity, and reconstruction (i.e., Steps 1–4), as *Guidelines* sets the bar very high to discourage the creation of misleading and even potentially damaging reconstructions. These detailed steps provided extremely valuable guidance for our case studies and could be a good starting point from which discipline-specific standards for digital reconstructions are developed. This process would require many adaptations, as detailed throughout this paper, as well as the development of discipline-specific guidance for the implementation of *Charter* standards not addressed by *Guidelines* (again not addressed by this paper). One significant area where *Guidelines* would need to be reworked for digital reconstructions is the inclusion and discussion of acceptable methods for addressing and documenting uncertainty as described by *The Charter*, particularly since there is so little tolerance for insufficient documentation in physical reconstructions. We also found the organization of *Guidelines* into definitions, standards, steps, and illustrative examples to be an effective and helpful format. *The Charter* also provides objectives, standards, and definitions but lacks steps and examples, both of which could be added to discipline-specific guidelines. Finally, we also conclude that in many instances digital reconstructions may be more appropriate than physical reconstructions, given the limitations and risks acknowledged in *Guidelines* as well as the flexibility of digital reconstructions accepted by *The Charter*. In fact, it might prove beneficial for *Guidelines* to be amended to recommend digital reconstructions as a viable alternative, provided the same level of rigor is applied (for example, the standards to document and preserve landscape characteristics could be retained).

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