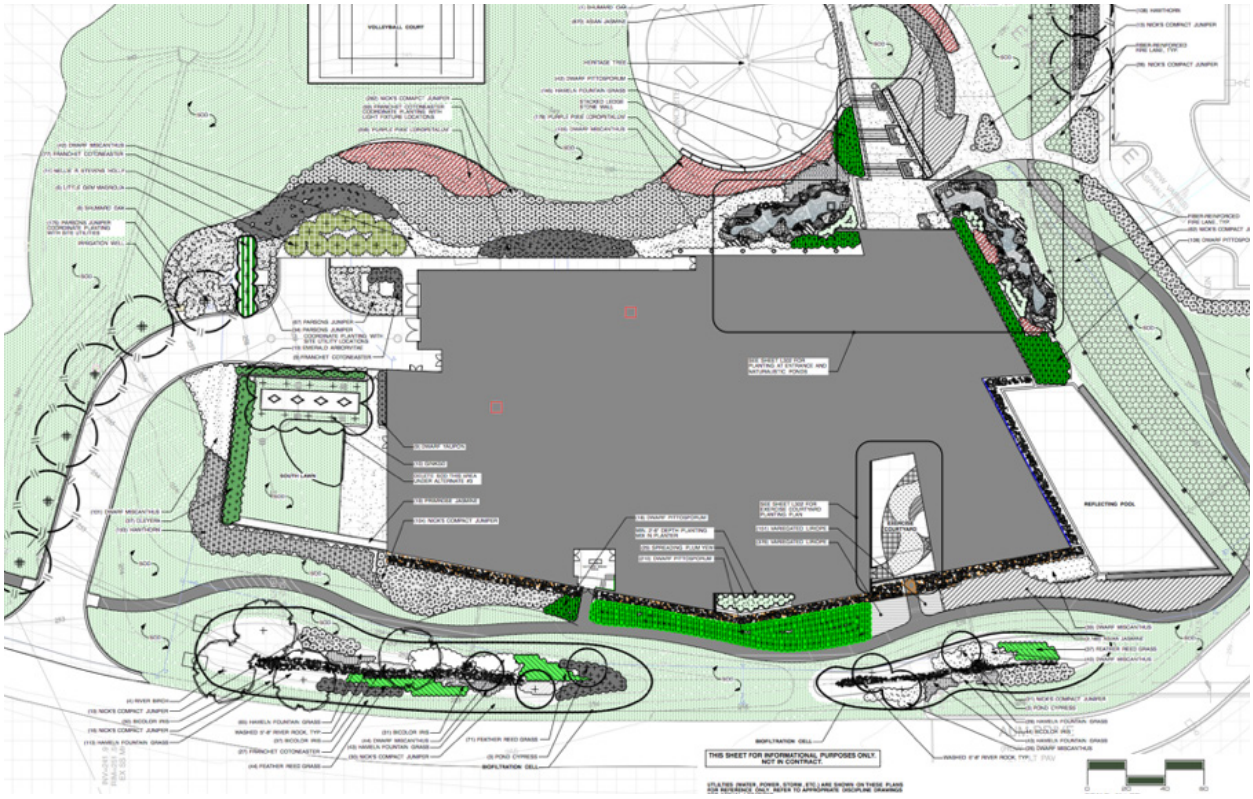
CASE STUDY:

HOLCOMBE NORTON PARTNERS, INC.
BIRMINGHAM, ALABAMA, USA

INTELLIGENT DESIGN PRACTICES MEET SMART SITE OBJECTS

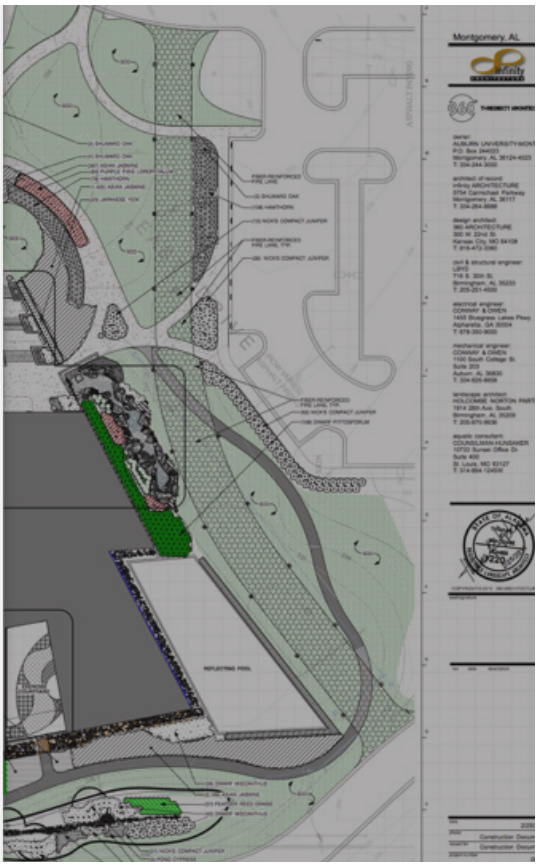
When most people hear the words "environmental sustainability," they think of fossil fuels and government initiatives, but for Stephen Schrader, associate landscape architect at Holcombe Norton Partners, Inc., sustainability arises from careful calculations and informed design decisions. The full-service landscape architecture team at Holcombe Norton Partners uses smart objects within their design software to perform these calculations quickly and efficiently, making their projects inherently information-rich. And while this decision may seem like a no-brainer, Schrader says that many landscape professionals have yet to jump on the smart object bandwagon.

"Landscape architects had little reason to join the revolution as architects made 3D modeling and BIM workflows standard practice," Schrader says. "Traditionally, CAD packages were geared toward the practices of architecture and engineering, offering few mainstream tools for landscape architects. But now, designers, product manufacturers, and industry associations are creating site-oriented BIM content, and the specialized software tools for landscape professionals are more helpful than ever."



From tools, to reports, to drawing coordination, The Student Wellness Center at Auburn University's Montgomery campus is an example of Holcombe Norton Partners' projects using smart objects in site design.

21	L-SOD-HI	Sod	0.00	0.0	0.0	0.0	0.00	0.000	0.00	
22	L-SOD	Sod	127,836.22	0.7	1.0	1.0	3.57	0.625	455133.97	
22.1	L-SOD	Sod	127,836.22	0.7	1.0	1.0	3.57	0.625	455133.97	
23	L-SOD-LO	Sod	0.00	0.0	0.0	0.0	0.00	0.000	0.00	
24		**Total Landscape Area**	**147657**	**sq. ft.**				**TWA**	**510,861.95**	**gal.**
25										
26				**Available non-potable water for re-use**					**0.00**	gal.
27	**Design Case**			**Controller Efficiency Factor (≤1.0)**			**0.75**		IE (Irrigation Efficiency) factors are assigned below assuming standard practices for LEED projects, with drip irrigation in shrub areas and high-efficiency sprays in lawn areas. Default values: Sprinkler .625; Drip .9. Other factors may be used; provide backup.	
28	**Sod Ks (0.6-0.8)**	**0.6**	**Density Factor**		**0.5**	**Bed IE**	**0.63**		**Sprinkler IE**	**0.750**
29	Microclimate Layer	Planting Type	Area (sq. ft.)	Ks	Kd	Kmc	ET(L)	IE	TWA (gal.)	
30	L-TREES-HI	Trees	0.00	0.0	0.0	0.0	0.00	0.000	0.00	
31	L-TREES	Trees	1,050.00	2.0	1.0	2.0	1.79	1.250	672.32	
31.1	L-TREES	Trees	575.00	0.2	0.5	1.0	0.51	0.625	219.34	
31.2	L-TREES	Trees	475.00	0.5	0.5	1.0	1.28	0.625	452.98	
32	L-TREES-LO	Trees	0.00	0.0	0.0	0.0	0.00	0.000	0.00	
33	L-SHRUBS-HI	Shrubs	9,187.16	1.0	0.5	1.4	0.71	0.625	4906.34	
33.1	L-SHRUBS-HI	Shrubs	9,187.16	0.2	0.5	1.4	0.71	0.625	4906.34	
34	L-SHRUBS	Shrubs	3,728.91	1.0	0.5	1.0	0.51	0.625	1422.43	
34.1	L-SHRUBS	Shrubs	3,728.91	0.2	0.5	1.0	0.51	0.625	1422.43	
35	L-SHRUBS-LO	Shrubs	2,274.43	2.0	1.0	1.0	0.89	1.250	446.93	
35.1	L-SHRUBS-LO	Shrubs	2,228.53	0.2	0.5	0.5	0.26	0.625	425.05	
35.2	L-SHRUBS-LO	Shrubs	45.90	0.5	0.5	0.5	0.64	0.625	21.89	
36	L-SHRUBS-HI	Groundcover	0.00	1.0	0.5	1.3	0.66	0.625	0.00	
36.1	L-SHRUBS-HI	Groundcover	0.00	0.2	0.5	1.3	0.66	0.625	0.00	
37	L-SHRUBS	Groundcover	0.00	1.0	0.5	1.0	0.51	0.625	0.00	
37.1	L-SHRUBS	Groundcover	0.00	0.2	0.5	1.0	0.51	0.625	0.00	
38	L-SHRUBS-LO	Groundcover	336.05	3.0	1.5	1.5	1.79	1.875	144.52	
38.1	L-SHRUBS-LO	Groundcover	65.18	0.5	0.5	0.5	0.64	0.625	31.08	
38.2	L-SHRUBS-LO	Groundcover	129.56	0.7	0.5	0.5	0.89	0.625	86.49	
38.3	L-SHRUBS-LO	Groundcover	141.30	0.2	0.5	0.5	0.26	0.625	26.95	
39	L-MIX-HI	Mixed	875.94	1.0	0.6	1.4	0.86	0.625	561.35	
39.1	L-MIX-HI	Mixed	875.94	0.2	0.6	1.4	0.86	0.625	561.35	
40	L-MIX	Mixed	2,245.03	1.0	0.6	1.3	0.80	0.625	1335.97	
40.1	L-MIX	Mixed	2,245.03	0.2	0.6	1.3	0.80	0.625	1335.97	
41	L-MIX-LO	Mixed	123.24	3.0	1.8	1.5	2.14	1.875	53.49	
41.1	L-MIX-LO	Mixed	55.81	0.5	0.6	0.5	0.77	0.625	31.93	
41.2	L-MIX-LO	Mixed	10.70	0.7	0.6	0.5	1.07	0.625	8.57	
41.3	L-MIX-LO	Mixed	56.73	0.2	0.6	0.5	0.31	0.625	12.98	
42	L-SOD-HI	Sod	0.00	0.0	0.0	0.0	0.00	0.000	0.00	
43	L-SOD	Sod	127,836.22	0.6	1.0	1.0	3.06	0.750	243821.77	
43.1	L-SOD	Sod	127,836.22	0.6	1.0	1.0	3.06	0.750	243821.77	



The smart object is the crux of this new era in landscape design, combining an object's geometry with appended data about said object, which can then be used by data-harvesting worksheets to run in-depth site analyses. Worksheets can do everything from calculating water-use reduction and organizing plant data to verifying compliance with green codes and quantifying construction costs. All of these capabilities combine to empower designers to make intelligent choices as their project progresses, rather than having to make revisions after they're already done.

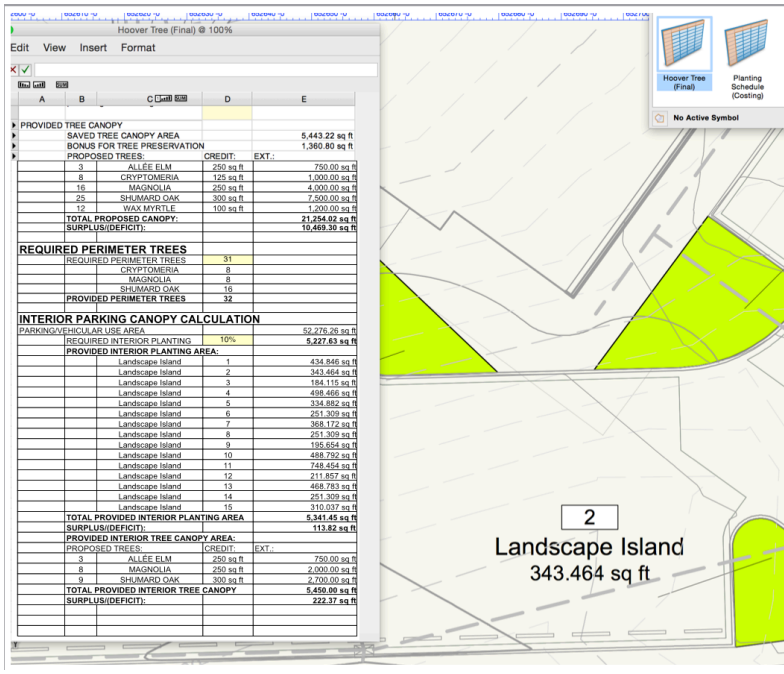
"I use worksheets to help meet all kinds of local codes and landscape ordinances," Schrader says. "Once I balance out those requirements, I'll put the worksheets right onto the design drawing. This makes it easy for reviewers to see that I've completed all the background work. And just like with any other facet of the design process, meeting all the legal requirements for a site plan, in addition to rating systems like LEED and the Sustainable Sites Initiative (SITES), can become a bit of a balancing act."

SOWING THE SEEDS OF SUSTAINABLE DESIGN

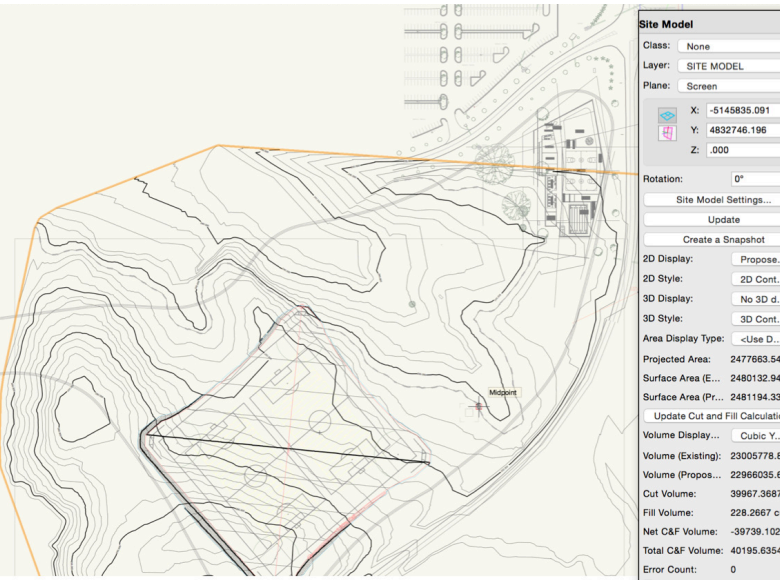
There are three competing sets of demands to address when beginning a successful project. Balancing the needs of each while still producing innovative landscape design can be a challenge. The first set of demands comes from the client in the form of an initial site program. While this may seem basic, the needs of a client, such as their desired uses for the space, required parking, spatial constraints, and budget limitations, often conflict with the the second set of requirements faced by landscape professionals: meeting landscape ordinances.

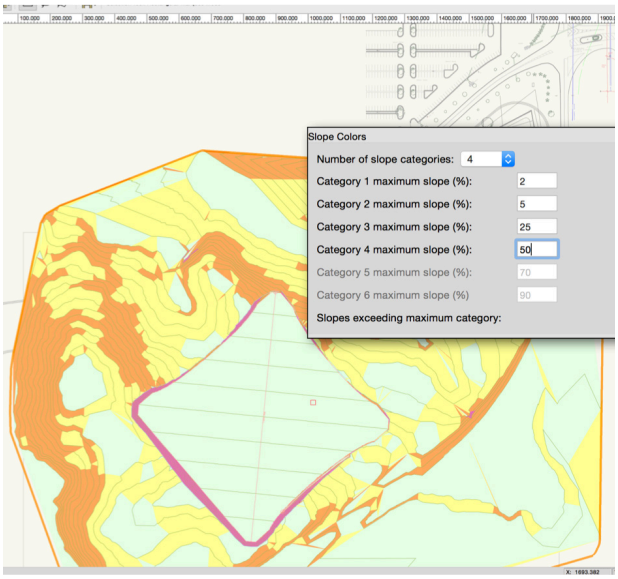
"These days, landscape ordinances are increasingly common, which is great because it means more sites will benefit from a landscape architect's influence," Schrader says. "But it adds a level of complexity to your site plan because now you don't just have to think about your building, parking, and grading. You also have to allow for things like extra spaces for landscape areas within a parking lot, perimeter planting and buffer regulations, and saving existing trees."

And if a client wants to go beyond meeting local and state regulations and wants their site to achieve LEED or SITES certification, a third set of demands has to enter into this balancing act. Designers now have to consider issues like open spaces versus buildings in their plan, as well as heat island effects, opportunities for shading, and reducing water use for irrigation. "While it's great that clients want their sites to be more sustainable, it can be difficult to prioritize so many sets of regulations," Schrader says. "This is where designing with smart objects makes all the difference."



Data harvesting worksheets are key to helping designers meet the requirements of guideline-driven design (e.g., LEED, SITES or local codes).





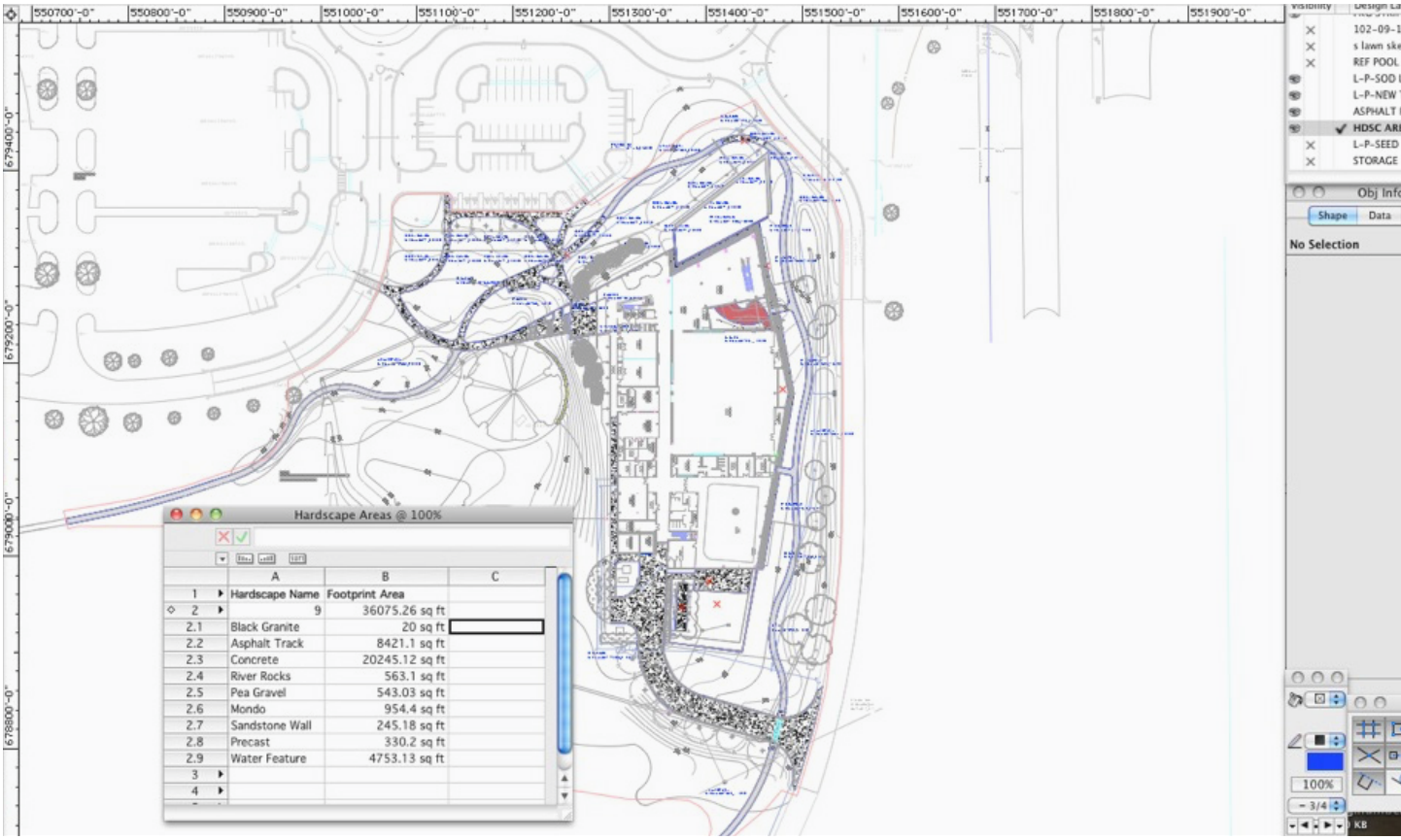
TAKING STEPS TOWARD SMART WORKFLOWS

A project file must act as a database to truly make use of BIM workflows in landscape design, according to Schrader. Rather than designing in one file and recording information in another, designers can combine their entire workflow into one document using smart objects. At Holcombe Norton Partners, this process begins with creating a digital terrain model (DTM).

"Landscape architects can use DTMs to produce more accurate, complete pictures of the costs of implementing their designs," Schrader says. "Tasks like terrain and slope analysis can be accomplished by adjusting a few of the DTM's smart object parameters, helping you reduce the amount of waste material you haul away, as well as minimize your project's impact on the environment, existing utilities, and other site constraints like road routes and buildings."

Creating a DTM is useful for making big-picture decisions at the beginning of the design process, and it also continues to inform decisions as a project develops. Since DTMs are composed of smart, parametric objects, each change made to a design impacts the data stored within those objects. By connecting this data to worksheets that run analyses for landscape ordinances and sustainability accreditation, designers can test the effects of every decision they make in real time.

"One example of how smart objects and worksheets help in the balancing act of designing a site plan is looking at whether the plan provides adequate building area, parking, and hardscapes while preserving enough vegetated open space to meet credit criteria," Schrader says. "Preparing a worksheet to draw area data from a few smart polyline objects, and modifying those polygons to match the layout as it changes, is a simple way to track compliance throughout the project. Often, this can be accomplished using shaded or filled areas that also improve the legibility of the working drawings."



PUTTING DTM INTO PRACTICE

This way of designing was put to the test at Auburn University, Montgomery's Student Wellness Center in Montgomery, Alabama. The university wanted the site to be a dramatic announcement that the school was reaching out to become a part of the community. However, the site was lower than the highway that ran alongside the campus. Additionally, civil engineers had calculated that a large amount of earth would need to be moved to give the center the prominent position that the architects and clients desired. The task of accomplishing this practical goal for the client fell to Schrader and the team at Holcombe Norton Partners. Adding even greater complexity, the clients also wanted to have the building LEED certified, meaning the whole team of designers needed to find creative solutions to meet the university's needs.

Holcombe Norton Partners took on this challenge by using a DTM connected to various worksheets, each calculating everything from elevations and slopes to the cost of moving materials and the amount of green space on the site. After identifying an area within the site that earth could be taken from, they developed a grading plan that allowed for the build-up of the Wellness Center site and turned the borrow area into intramural fields, while carefully weaving the access walks and retaining wall into the design in order to save a heritage-quality red oak tree with an 85-foot canopy.

While this plan met the client's goal in a practical and efficient way, more work was needed to make the site truly sustainable. That's why Holcombe Norton Partners' site design also included smart hardscape and planting objects. This approach empowered the team to utilize worksheet analyses to reduce the project's overall heat island effect despite having nine different hardscape types on the site. They also cut water usage in half through plant species selection and plant density reduction. In fact, the campus' landscape crew is currently preparing to remove the drip irrigation system installed during the construction process now that the plantings are established. Thanks to the smart design process used in its creation, the Wellness Center is on its way to being certified LEED Silver.

"This is one of the projects I'm most proud of, and not just for the sensitive siting and selection of sustainable planting and paving materials," Schrader says. "We were really able to create some exciting showpieces in the design." This includes bringing the architects' concept to life with the inclusion of a 5,000-square-foot, granite-faced reflecting pool outside the Wellness Center's cardio room, as well as the creation of two naturalistic water features that appear to flow beneath a faux bridge leading to the main entrance. "We originally conceived of the naturalistic water features as a method of capturing and treating stormwater collected on the expansive roof of the Center," Schrader recalls. "But the university chancellor liked the idea so much, he wanted water at the entrance all the time." Roof water is instead diverted to a bioswale between the walking track and the campus perimeter road on the side of the site facing the highway.

SUSTAINABLE DESIGNS FOR A SUSTAINABLE BUSINESS

"Since the advent of rating systems like LEED and SITES, design software has become more important to the creative process," Schrader says. "With a couple of clicks, I can quantify my open space, design planting areas, and create a water budget. Then I can work back to my baseline to see if I'm meeting criteria in order to get credits." Multiple programs exist to coordinate a site design's information and run calculations. "Applications like Apple's Numbers and Microsoft Excel are great ways to manage data, but they don't automatically pull information from the site features within a project file," Schrader says. "At Holcombe Norton Partners, we use Vectorworks® Landmark software to integrate data management and calculations to facilitate a smart design process."

"The depth of the landscape-specific resources available in Landmark, combined with its intelligent worksheet and water budgeting capabilities, makes it a major part of our office's design process," Schrader says. "Our whole office uses Landmark, and I can't imagine trying to do those calculation-oriented tasks without it." By using smart objects and worksheets, Schrader and his teammates produce designs that both please their clients and help the environment, which, in turn, helps their business to grow. Perhaps equally important to clients' happiness is the time-savings that comes with streamlining the connections between design and data. And, according to Schrader, landscape professionals can benefit without shifting their workflows from 2D design to 3D.

"Perhaps the biggest myth, particularly where landscape architecture workflows are concerned, is that users must learn to work in 3D to take advantage of site information modeling technologies," Schrader says. "While manipulating objects in 3D and creating design renderings certainly have their uses in developing sustainable sites, users can work in a 2D drafting mode to conduct many processes and achieve results. For example, simple grading studies can be accomplished using a DTM in 2D view. In fact, they can even produce more legible, meaningful representations of the manipulation of the ground plane than a 3D model while also providing critical information like cut and fill volumes. Similarly, generating planting and irrigation plans can be prepared in a 2D workspace while taking advantage of the capabilities associated with the smart objects used to create them, such as generating planting schedules or calculating flows to size irrigation pipes."

Schrader emphasizes that this versatility in workflow affords a flexibility that encourages experimentation and innovation with every project. "Everybody works differently," he says. "In our office, there are five people who use design software just about every day. We each have different tasks to perform, and none of us approaches the workflows exactly the same way. Along the way, we may discover different ways of doing things that will save time or even just help standardize graphic styles. We all learn better ways to use Landmark by sharing with each other, and we never stop trying to improve and streamline the ways we provide solutions to our clients."

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ACKNOWLEDGMENTS

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