Evergrene

Evergrene
Palm Beach Gardens, Florida

On August 19, 2003 Evergrene became the first residential community in the world to achieve certification as an Audubon International Gold Signature Sustainable Development. The community is located on a nearly rectangular 360-acre parcel in the City of Palm Beach Gardens, northern Palm Beach County, Florida. To enhance the sense of "community", Evergrene supports inter-generational interests ranging from young families to active seniors. Residents enjoy a community center featuring a 12,000 sq. ft. clubhouse with exercise rooms, meeting rooms, dinner theater facility, and nature library. Outdoors, the community center has play areas for children, a swimming pool, athletic courts, and a planned fishing pier. Miles of sidewalk link all corners of the property, and a mile-long nature trail provides opportunities for solitude and education.

Four miles inland from the Atlantic Ocean, Evergrene's geographic center is 26º 52' 23" North Latitude and 80º 05' 54" West Longitude; public land survey reference: T 41 S, R 42 E, S 25 & 36. Evergrene occupies the ideal sustainable development site as the property is completely surrounded on four sides by lands either developed or slated for development. The north boundary, Donald Ross Road, also marks the boundary between the City of Palm Beach Gardens and the Town of Jupiter. Military Trail to the west, Hood Road to the south, and Alternate A1A to the east delineate the other three sides of the property. Prior to development the dominant feature was a 36.5-acre lake in the south central portion of the property (Figure 1). This lake originated as a "borrow pit" from which soil was taken to build Interstate 95 (I-95) about one mile to the west.

Also visible in Figure 1 are drainage canals. These features were part of the south Florida system of canals created following the devastating floods that inundated the region after two successive 1948 hurricanes. The southern pre-development canal channeled rainfall into the large lake where the water was contained before moving further downstream. In contrast, the northern pre-development canal ran straight through the property quickly funneling storm water (with significant loads of particulate matter and dissolved solids) to downstream tidal areas.

Historically, the predominant vegetative cover type on this site was Pine Flatwoods comprised of an overstory of Slash Pine and understory of Saw Palmetto. More mesic soils within the parcel also supported Live Oak. Pre-development surveys showed that, of the 360 total acres, about 240 acres were occupied by either of two common south-Florida exotic invasive species: Melaleuca (Figure 2a) or Brazilian Pepper (Figure 2b).

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Melaleuca

Brazilian Pepper

Native Plant Community Conservation

As noted above, pre-development surveys showed that almost two-thirds of the Evergrene site was occupied by Melaleuca or Brazilian Pepper. Melaleuca, a native of Australia, was introduced to southern Florida in the early 1900's with the intent of drying wetland sites for agricultural use. As a prolific seeder with no natural enemies in its new habitat, this species quickly became a nuisance plant out-competing native vegetation throughout south Florida. Brazilian Pepper is native to South America and was brought to Florida as an ornamental shrub. The red berries appear in late fall through the winter months. Birds are attracted to the berries and serve as the primary means of dissemination. Again, with no natural biological "checks" this plant now (according to the USDA Agricultural Research Service) occupies more area in Florida than any other invasive species.

Evergrene's site preparation work began in January 2002, and the first step was complete removal of Melaleuca and Brazilian Pepper from the entire property. But since cutting the stems of these plants promotes both seed germination and vigorous sprout regeneration, stump treatment with a systemic herbicide is necessary to suppress new growth. Melaleuca will be kept from the property using a combination of on-site vegetative monitoring and biological control insects introduced to south Florida, from Australia, by the USDA Invasive Plant Research project based in Fort Lauderdale, Florida. Unfortunately, Brazilian Pepper must be addressed in a different manner. Since there are, as yet, no effective biological controls available to keep this plant in check, a vigorous vegetative monitoring program coupled with hand removal and stem herbicide applications will keep Brazilian Pepper from resurfacing as a dominant nuisance at Evergrene.

Following the removal of all exotic invasive plant species from the site, attention turned to re-vegetating cleared areas and to long-term management of Evergrene's preserved upland vegetation.

Re-vegetation

Probably the most intensive native plant conservation process at Evergrene came with the transplanting of slightly over 2,200 trees. As exotic removal and land preparation progressed, smaller Slash Pine and all healthy Live Oak trees were identified, marked for protection, and saved in place or eventually transplanted on the property.

Tree spade transplanting Live Oak

In addition to the native trees saved and transplanted on site, over 200,000 bare-root and containerized native plants were used to re-vegetate the site; some were as tall as the 50-foot oak installed near Evergrene's Military Trail Entrance (Figure 5). Of the total Evergrene landscape plant palette, approximately 75 percent are species native to south Florida. Figure 4 shows the results of typical landscape plantings in the community.

Typical Evergrene Streetscapes

Green areas are Upland Preserves

Managing the Preserves

Illustrated by the green shading , more than 80 total acres of Pine Flatwoods have been set aside at Evergrene as Upland Preserve. Processes in forests proceed so slowly that we tend to think of them as unchanging entities able to take care of themselves. In a truly natural circumstance this is a valid assumption. However, where forest vegetation intersects with human settlement active management is necessary.

National media coverage shows that U.S. suburban lifestyle continues to expand deeper into areas dominated by forest and brush-land vegetation. The aesthetic benefit of living in close proximity to natural systems is obvious, but with that benefit also comes the risk of living in close proximity to catastrophic natural processes. As has happened in Colorado and California in recent years, dry season fires are a natural occurrence in many geographic regions including south Florida. To reduce the risk of catastrophic fire, vegetative management regimes must be developed and instituted to reduce understory fuel load. Historically, the method used for reducing fuel-load in managed forests was periodic application of a process called *prescribed burning*. For obvious reasons prescribed burning is too risky an option for vegetative preserves surrounded by home sites. On the other hand, as the Yellowstone fires of the late 1980s proved, long-term suppression of natural fires only serves to allow accumulation of fuel-loads to levels that eventually result in uncontrollable fires. Instead of prescribed fire, Evergrene's Upland Preserves will be managed using mechanical means to reduce, but not eliminate, understory vegetation. Simulating the natural process of fire ignited by lightning, small patches of understory will be "mowed" annually using a special machine designed to cut and mulch vegetation back to the ground line where it will slowly decompose returning nutrients to the soil for uptake by remaining plants. When Pine Flatwoods burn naturally, Slash Pine trees are unaffected by low intensity fires. Working to keep in balance with nature, small Slash Pines will be avoided during the mowing process. The understory species that will be mowed and mulched will not be killed. Similar to grasses, removal of the stems and leaves triggers development of new stem-forming buds fed by sugars stored in the root system. Within a few years the treated areas will return to their pre-mowed appearance. Through continuing natural resource management, Evergrene's

Upland Preserves will remain similar to the current scene.

Upland Preserve vegetation

Water Quality Management

The development of Evergrene actually served to improve local water quality. "Primary" water quality treatment, which is the removal of suspended solids, is best achieved by either slowing or stopping water movement. The longer water flow is retarded, the greater opportunity for particulate matter to settle out of the water stream. As previously noted, on the northern section of the property a straight-line canal channeled water across the property with no means to detain or slow storm water flow. This canal represented flood control at its best, i.e., keep the water moving to the ocean as quickly as possible. However, good flood control does not necessarily mean good water quality control.

Keeping both flood control and water quality in mind, the northern canal has been replaced by a series of lakes and wetlands. The storm water control system provides sufficient storage capacity to keep all water from a 25-year rain storm on site for 24 hours. While, the main objective of flood control is holding water "inside the banks", holding or stopping the water also creates the opportunity for particulate matter to settle. Recent data from the South Florida Water Management District (SFWMD) indicate that the average residence time for water in lakes such as those at Evergrene is in excess of 180 days. This finding surprised even SFWMD personnel; that which was thought to be a good system actually proved to be outstanding primary water quality treatment. Good as it might be, it can be improved if the design is enhanced by the addition of littoral shelves (gentle slopes from the shore line to about 8 feet out into the lake) planted with emergent aquatic vegetation. Then the system not only accounts for particulate settling but also filtering of dissolved nutrients directly from the water as it flows across the land and around the aquatic plants on its way into the lakes. All of Evergrene's lakes have littoral shelves planted with native emergent aquatic vegetation such as: Duck Potato, Pickerel Weed, Bull Rush, and Spike Rush. The greater the plant density and the longer the residency time, the greater is the removal of dissolved and suspended substances from the water.

Evergrene also uses another type of plant filtering process. The wetland is created by installing an earthen berm across the water body to retard the downstream water movement; plants are then installed on the upstream side of the berm. As the plant community matures it forms a dense mat to filter water as it flows downstream through the wetland. Again, the denser the plant community and the longer the residency time, the greater the cleansing effect. Since the system is designed to accommodate up to a 25-year storm, all but the most severe rain events will be contained in the system for six months or longer. Figure 8c shows a straight downstream view through the constructed wetland.

Constructed wetland

A straight downstream view through the constructed wetland.

At the south end of Evergrene the 36.5-acre lake was retained as part of the storm water control system. Littoral shelves were added to the edges, and the shelves were planted with emergent aquatic vegetation. Given its size, the large lake serves as a robust storm water control feature, and with storage times equal to or in excess of other lakes on the property it too provides a significant contribution to water quality.

Wildlife Conservation

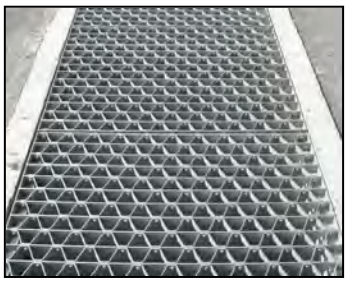
As any wildlife biologist will be quick to say, managing wildlife really means managing the habitat. In the words of a popular movie "If you build it, they will come." Creating the Evergrene community really was a process of "building" or, for the Upland Preserves, improving wildlife habitat. While there were upland birds and Gopher Tortoise present prior to construction, the diversity of habitat was limited. Moreover, much of the native vegetation was being overrun by invasive exotics which do little to support native wildlife. Following the removal of exotic plant species and the creation of lakes, habitat conditions changed substantially. Instead of high stem densities and thick canopies with little light reaching the ground, "clean" stands of Pine Flatwoods now occupy the Upland Preserves. There are also savannah-like grasslands, and nearly 60 acres of open water with 3.2 miles of shoreline and littoral shelf supporting aquatic plant life. Wading birds such as Blue Heron, Snowy Egret, Wood Stork, and Great Egret (Figure 10a) arrived following the emergence of aquatic plants above the water line.

These species are now a common occurrence at Evergrene as are various species of migratory waterfowl such as Mottled Ducks. It is noteworthy that the animals seem to utilize the berms and wetland plants as refuges, and, since they are effectively "out of reach" in these places, tend to ignore humans.

Prior to land clearing, Gopher Tortoises were relocated to the Upland Preserves. In the Upland Preserves exotic removal was accomplished by hand instead of machines. This minimized soil disturbance, minimized damage to vegetation, and protected the tortoises from fatal encounters with moving equipment. Around the outside of the Upland Preserves a tortoise fence was installed to keep the ground dwellers from wandering in harms way on nearby construction sites. The Upland Preserve consists of three main pieces separated by roads. "Critter crossings" were installed at two locations to provide connectivity for long-term gene flow through the 55 acres of juxtaposed habitat. Since research shows that some animals resist entering dark passageways, the "road bed" portion of the crossings are constructed similar to steel drainage grate which allows light to penetrate into the tunnel.

It is not uncommon to hear a Gopher Tortoise noisily pushing through the Saw Palmetto, or see one eating grass in the open spaces of the Upland Preserves.

"Critter crossings"



Steel drainage grate

Tunnel

Rain Sensor

Water Conservation

Unlike golf courses where water management is under the direction of one or two people, in a residential community, where there are hundreds property owners, water conservation requires a new strategy. Therein lays the advantage of large, planned-unit-developments such as Evergrene in contrast to piece-meal or patch work building on individual house lots. In planned developments attention to details such as irrigation water usage can be controlled or mandated at the community level. At Evergrene all individual and common area irrigation control stations are equipped with rain sensors to minimize inefficient use of water. In addition, the use of native vegetation virtually eliminates the need to irrigate landscape plants. Once the native landscape plants become firmly established, irrigation for them will be disconnected or disabled.

Integrated Pest Management

Integrated Pest Management (IPM) presents another challenge in a residential community. Again the concept of planned developments is an advantage. The landscape maintenance contractor for common areas works closely with the Evergrene Property Manager and with the Evergrene Natural Resource Manager. The maintenance contractor is apprised of IPM philosophy and goals, and has been supplied with the list of chemical substances approved for use as specified in the Evergrene Natural Resource Management Plan.

As for yard maintenance on individual house lots, IPM information will be disseminated to community residents in the form of brochures and educational seminars as part of the Evergrene Information & Outreach Program.

Club Evergrene

As noted in the opening section, Evergrene has a community center located directly at the north end of the large lake. ***Club Evergrene***, as the facility is called, is the focal point of many activities for community residents. As shown in Figure 15, there are meeting rooms with a stage and back stage area that, in conjunction with an adjacent full-service kitchen, can double as a dinner theater. Exercise rooms, locker rooms, and children's play room occupy the opposite wing of the building. Centrally located in the building is a library that will feature books of all types including a large selection of "nature" related publications (Figure 15). Outside the 12,000 sq. ft. structure additional children's play areas may be found along with a full-sized swimming pool and recreation courts of various kinds including volleyball, bocce, and basketball.

Energy Efficiency

"Energy efficient" and "Green Building" are terms commonly heard since the 1970s. The initial attempt at creating products that were energy efficient or built "green" resulted in homes that looked like thatched huts or were half-buried in the ground with a garden growing on the roof. These were not marketable concepts to most people, if for no other reason than, because it was hard to measure the benefit versus the cost.

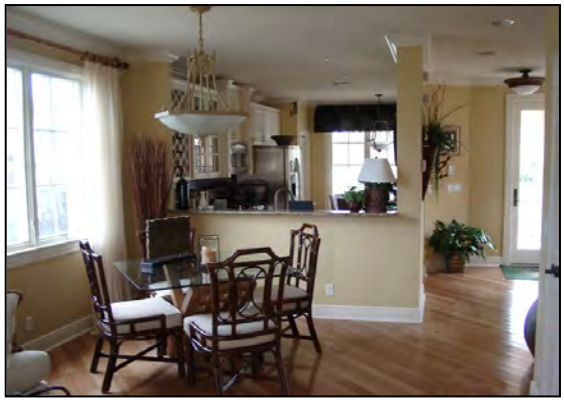
"Energy efficiency" sounds good because it implies saving money, but, similar to miles per gallon in automobiles, how can "energy efficiency" be measured on a scale people can understand? That was a question asked by a group of home mortgage industry leaders in 1981. These forward thinking people wanted to develop a system for factoring energy efficient features into home mortgage loans. Apparently this was not an easy question to answer; in fact it took seventeen years of evolution through private and public sector initiatives. In 1998 the mortgage industry in cooperation with state energy officials adopted the *Mortgage Industry National Home Energy Rating System Accreditation Standard*. For obvious reasons, that title has been shortened to ***Home Energy Rating System*** or **HERS**.

The development of a standardized rating system was really a "bottom-up" process. Recognizing the value of an energy rating system, in the late 1980s and early 1990s, several states undertook independent initiatives to develop their own systems; the national system grew out of these pioneering, state-level

efforts. So today, based on a national consensus developed by the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA) and adopted by the mortgage industry, homes are rated on a point system from 1 to 100. Homes built to a standardized minimum energy code achieve a HERS score of "80". Putting these numbers in perspective, according to information collected by DOE/EPA, every point above "80" (on the scale of 100) translates to an increase of 5% in energy efficiency. Subsequently then, DOE and EPA established the ***Energy Star*** program to set a target for energy efficiency. "86" is the required HERS score for ***Energy Star*** rating. Calculating from the 5%-per-point data, an ***Energy Star*** rated home would be 30% more efficient than a comparable home built to minimum energy codes. The 1998 system has undergone some evolution in that a few states have moved to make minimum code standards more stringent, but the essence of the rating system has not changed. Florida, for example, has now set the minimum HERS score at "82". The evolution amounts only to raising the minimum "bar" to take advantage of improved technology. Therefore, homes with a HERS score of "82" are still interpreted as 10% more efficient than a comparable home with a HERS score of "80".

Energy efficiency falls under the umbrella of another loosely defined term: "Green Building". In essence "Green Building" is really about natural resource conservation. Although there are many ways to define "Green Building", the process can be viewed as applying conservation measures in four broad areas: Energy, Materials, Health, and Native Ecosystems. The *Florida Green Building Coalition* (FGBC) set out to define "Green" for Florida homes. FGBC developed a rating system from 1 to 400 points; a minimum of 200 points is necessary to become a ***Certified Florida Green Home***. The biggest single contributor in the FGBC rating system is Energy which accounts for 175 of the 400 points. The remaining categories cover water, health, landscaping, and building materials. Public utilities and private sector energy suppliers have also developed ways to measure and reward energy efficiency. This may sound contrary to good business. But, as population expansion continues, if each consumer uses less energy, the energy companies will be able to serve more people with existing generation capacity. This, then, delays the need to build more generating plants.

With all this as background, acclaimed luxury home builder WCI decided to use their Evergrene project, located in Palm Beach Gardens, as a "test bed". The team at Evergrene selected a standard floor plan from those available to all Evergrene home buyers, and, paying close attention to principles of "green building", created one of the most energy-efficient homes in the State of Florida. The HERS score for the Evergrene Green Home was 92 out of 100. Based on DOE/EPA information, a score of 92 means that the Evergrene Green Home is at least 60% more energy efficient than a comparable home built to a minimum energy code specification of HERS score "80". Since the Evergrene Green Home scored above the minimum "86", it is certified as an ***Energy Star*** home. The Green Home is further acknowledged as a ***Certified Florida Green Home*** by the *Florida Green Building Coalition* with a score of 314 points out of 400 on the FGBC check list. A third distinction came in the form of inspection and approval as a ***Build Smart Gold*** energy efficient home by *Florida Power and Light Company*.



Evergrene Green Home, inside and out

The Green Home reveals no indications of its energy efficiency. It looks like any other home in the Evergrene community, and that was one of the objectives of the experiment. The Green Home was deliberately made super energy efficient to see how to "fit" the selected options into a standard WCI production home. While the Green Home contains over $75,000 dollars in green upgrades, subsequent analysis of cost efficiency for energy reducing options indicates that a 2,200 sq. ft. home (approximately the current U.S. average) could achieve ***Energy Star*** status at a cost less than $5,000. This may sound like a significant increase in cost, but keep in mind that ***Energy Star*** homes qualify for Energy Efficient Mortgages (by that title). Energy Efficient Mortgages allow buyers a higher debt-to-income ratio based on the assumption that monthly energy bills will be lower than with a non-***Energy Star*** home. With this advantage, buyers may qualify for lower mortgage interest rates, and for as much as an additional $9500 debt on a $150,000 home, or as much as $15,000 additional debt on a $250,000 home.

This would be a story without a "moral" if it stopped here. While reducing energy consumption by 60% seems like an astounding accomplishment, building one super-energy-efficient home is not really "news" because it has been done before. What is newsworthy however, is that WCI has already begun to incorporate the "how to" knowledge gained from the Green Home into all homes being built at Evergrene. Each home is inspected and approved by *Florida Power & Light* as ***BuildSmart*** energy efficient. This means each home must pass tests showing it to be at least 10% more energy efficient than a home built following standard code specifications. In addition to ***BuildSmart***, recent evaluations also indicate that Evergrene's homes may easily achieve a HERS score of "86", thus qualifying them for ***Energy Star*** status. These examples show that WCI is bringing significant elements of energy efficiency into the mainstream by standardizing them in production homes. This is a significant contribution to society.

"Green building" has a steep learning curve, and cannot be accomplished by traveling to your favorite hardware store to buy "one of these" and "one of those". Green building is all about selecting the correct combinations of materials with which to build a home; any floor plan can be made "green" if it is built with the "right stuff". Materials selection is not intuitive either. For example, the single item that probably has the most significant impact on energy consumption is the Heating, Ventilation, and Air Conditioning (HVAC) system. With air conditioners people tend to think that bigger is better. However, oversized HVAC units will cool the air too quickly without lowering humidity. In the south this will most likely develop into a mold and mildew problem that can make a home unlivable. Similarly, dual-pane insulated glass windows might be highly advised in northern climates, but in south Florida there may be a much better return on investment. At lower latitudes, single-pane windows designed with a coating to reflect solar energy provide much greater reductions in energy costs. It is true that any new or retrofit home can be made "green", but home owners and home buyers are well advised to seek advice from professional people who study the literature and deal with green building practices every day.

As a final note, while energy efficiency and green building practices can result in healthier homes and significant cost savings in monthly energy bills, it is important to remember that the long-term goal is to reduce resource consumption today so that society's grandchildren have a greater chance at quality of life for all future tomorrows. For more information on energy efficiency and green building, visit the web sites:
www.energystar.gov
www.natresnet.org
www.floridagreenbuilding.org

Waste Management

Waste management began from the very first days of land clearing. As shown in Figure 18, vegetative materials cleared from the site were either trucked to a mill to be processed for sale as wood chips, or ground into small pieces and sold for use as mulch.

Once house construction began, dumpsters (specifically labeled for recyclable materials versus trash) were situated in strategic locations in all subdivisions under construction. Period checks inside dumpsters indicate workers were following the labels and putting construction materials in the correct waste bins.

Information and Outreach

Evergrene's Information and Outreach Program was in operation even before the first home was completed. One of the objectives of the I/O process is to provide environmental education opportunities to local schools. In that sense much activity has taken place. For example, in autumn 2002 a fifth grade class in Boca Raton, Florida worked on an energetic project to study development in south Florida. With the class split to represent agricultural, environmental, and building industry interests, their charge was to reach a compromise position that would provide the greatest benefit for all concerned. Evergrene's Natural Resource Manager was invited to "consult" with the students as a representative from the building industry. The students worked on the project throughout the school-year; the final compromise position was presented in May 2003. It was inspiring to watch the expansion of their knowledge and awareness of environmental issues and political processes.

A similar effort is in progress during the 2003-2004 school-year – this time with the Jupiter Community High School in Jupiter, Florida. Students in the school's Environmental Academy are conducting a study of the Loxahatchee River watershed. Co-sponsored by WCI Communities and 1000 Friends of Florida, the goal of the project is to create an internet web-site that will serve as the outlet conduit for the study's final "report". On the web-site, Academy students will use a combination of video tape, still photography, and the more traditional "written word" to report their results.

Information and Outreach activities also occur within the Evergrene community. Club Evergrene opened first quarter 2004. The facility contains an office for the Evergrene Natural Resource Manager, a library that contains a host of environmental references and resources, and meeting rooms where classes are held for residents of all ages.

Another teaching laboratory is available at Evergrene. As indicated by the red lines in Figure 20, over one mile of "Nature Trail" has been created through the larger blocks of Evergrene's Upland Preserves. The nature trial provides an opportunity for both group and individual educational opportunities. Scheduled "classes" take younger children out on the trail to study "bugs" or older "students" who perhaps wish to learn about ecosystems and how they function. The trails are outfitted with benches at selected locations that allow residents to sit in the cool solitude of overhanging Live Oak trees or to watch wading birds forage in the Preserve's wetlands.

Comments and Quotes

"WCI proved it can be done -- that a well thought out suburban home landscape design using drought tolerant plants can be a beautiful, pleasing landscape that also conserves water. I was also impressed that in following the guidelines of our program, WCI incorporated innovative items like rain barrel and micro-irrigation systems as well as permeable pavers. The Evergrene community is a model for our program. WCI is one of the few developers out there doing this."

Carolyn Saft
Univ. of Florida's
Yards and Neighborhoods Program

"The WCI Green Home at Evergrene far exceeded the minimum requirements of the Florida Green Building Coalition's Florida Green Home Standard. The Green Home will cut energy costs by 50%."

Eric Martin
Univ. of Central Florida's
Florida Solar Energy Center.

Evergrene has been the subject of numerous television reports, as well as local and national newspaper and magazine articles including: local ABC, CBS, and Fox affiliates; CNN Headline News; Tech TV's "Tech Live"; Alive and Well TV (Goodlife Network); New York Times; New York News Day; Palm Beach Post; South Florida Sun-Sentinel; Green Magazine; and the Stuart News.