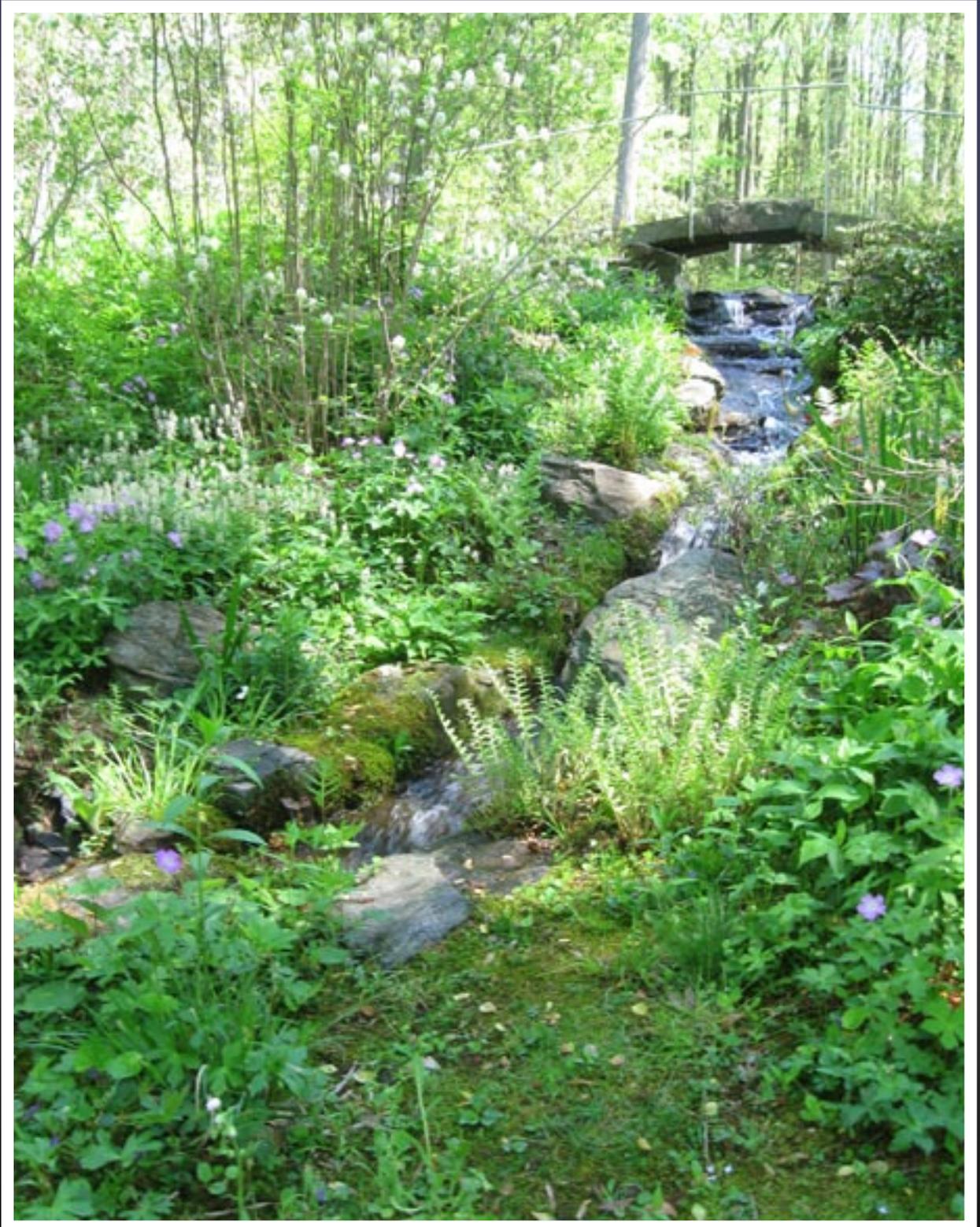




International Waterlily and Water Gardening Society

WATER GARDEN JOURNAL



SUMMER
Vol. 32, No. 2

2017



Tim Jennings, head of aquatics at Longwood Gardens, with one of the world-famous Victoria waterlilies.



A rare and unusual hail storm near Washington, DC, results a catastrophic fish death in a local water garden, but there is much debate on the actual cause of the fish kill.



Chanticleer include a community of Sarracenia, a water-loving, carnivorous plant in one of the garden's bog habitats. One of the botanical gardens on the 2017 IWGS Symposium itinerary.

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The Pond Garden at Mt. Cuba Center, a native plant botanical garden in Hokessin, Delaware, USA. Photo by Kathy Jentz, as well as all photos on this page.

Submissions

If you would like to submit water garden content for the next edition of the *Journal*, please send your submissions **before September 1** to KathyJentz@aol.com.

President's Letter

Hello, Everyone!

In my last letter, I mentioned that symposia are the glue that holds our little group together, and that with each one, I come away with new ideas. So, let me share one of these ideas which came to mind just the other day:

While attending the Denver Symposium in 2014, several of us were visiting in the Hospitality Suite at our hotel late in the evening. Ken Bernard, with Garden Ponds Nursery in Kilauea, Hawaii, shared a beautiful story with us. He was talking about "Raising the Vibration" at his store... and how he had hired someone to do just that—to arrange, re-arrange items, add color, and perspective where needed to please the eye and bring all into harmony for a calming and tranquil experience for visitors.

Being a gardener has always been a challenge for me. First of all, for the most part, I want immediate gratification, so I have learned (am STILL learning) patience. Secondly, I am "aesthetically challenged" as I like to put it, and as I look out into nature, I am conflicted: Gorgeous and natural, yet quite disorganized at times. As I look out into the Water's Edge yard, I am less forgiving: rows of plants and water garden products for sale must look like pristine soldiers all in a line... stakes, spinners, sculpture and other garden décor must be upright and plumb, and all the while, the displays of more casual offerings must look aesthetically pleasing and playful, with attention to continuity and balance. We are constantly straightening, artfully placing, re-placing, dusting, sweeping, etc. to beautify Water's Edge. I just didn't have the correct name for this type of activity!!

As some of you might know, my two grand-teens live with us. School is just now out for the summer, and we are thinking about some structure for them. When they were very little, they came to Water's Edge to help with "Algae Patrol" and other like-chores, but now as teens, they are too busy for such folly! AND...school is out, and there is no plan.

So I began a list of activities they might do at the store- to help clean-up and beautify. All of a sudden, it came to me: Raise the Vibration! Yes, that's it—and in doing so, help them elevate their sense of accomplishment and self worth—Perfect! Thank you, Ken!

Traveling this summer? If you fancy a "Place of Interest," take photos, give us an article about this site, and share the vibrations! Gardens, Landscapes, Historic Sites, Water Garden Nurseries and Shops... all are welcome! Submit your article for the next *Water Garden Journal*. Send it to kathyjentz@aol.com by September 1.

See you in the garden—Longwood Gardens, that is!!

Sincerely,

Susan Davis

IWGS President

we@watersedge.com

PS: Please consider contributing items for our world-famous live auction with none other than Gary Jones as our auctioneer! Bring them with you to the Symposium, or send early to:

Maryland Aquatic Nursery
Attn: IWGS Donation
3427 N. Furnace Road
Jarrettsville, MD 21084

Home Gardening Corner

How to Care for Marginal Plants

Marginal plants are simply the aquatic plants found growing around the edges, or margins, of your water garden. To create a natural-looking pond, a good selection of marginal plants is very important. There are hundreds of varieties to choose from and they come in all shapes, sizes, textures, and flower colors.

Attractive and Beneficial

Other than just adding beauty and naturalization, marginal plants also serve many other purposes in the water garden. They add valuable filtration to the pond and they remove elements that would otherwise feed algae. They attract and provide cover for wildlife, and you can also select from among many different hardy or tropical varieties.

In an [Aquascape design] ecosystem pond, marginal plants are generally placed directly into the gravel. This lets them thrive naturally and filter the water more effectively. Certain plants like thalia, bulrush, and reeds can be problematic and may even damage the pond liner. You should either avoid planting them altogether, or plant them in an aquatic pot, surrounding the pots with rocks and gravel to maintain the natural look of the pond.

Streams are another great place for marginal plants. Again, they provide valuable filtration as the water flows past their roots. They also soak up additional nutrients, minimizing algae problems. Just picture the last time you saw a stream in nature and all the wonderful plants growing in the water along its edges. That's the look you want to create.

Planting Considerations

Start by selecting the proper plant for the water depth, sun exposure, and location. Water depth is an important consideration when it comes to choosing aquatic plants. More specifically, the concern is with how much water a plant will tolerate above its crown. For this reason, most marginals are planted on the first shelf of the pond. Select plants of different heights, foliage types, and flower colors to create a pleasing mix.

After selecting the plants, it's time to place them in the pond. Start off by washing away most of the soil



Marginal pond plants set a pretty scene. Photo courtesy of Aquascape.

from around the root system. You don't want to disturb the root system of the plant, so be careful and avoid removing too much. Once the soil has been removed from the plant, push the gravel back and place it in the pond, filling the gravel back in around the root system.

The same process can be used for planting in a stream—carefully selecting aquatic plants that like or tolerate the stream's moving water. Not all marginal plants can thrive in moving water.

Special Care for Aggressive Plants

If the plant you decide to use is overly aggressive, you should consider leaving it in a pot to help contain the spread of the roots. Remember, most aquatic plants prefer width over depth in their respective growing areas so give them plenty of room to spread out. Many marginals are shallow-rooted, therefore depth is less of a factor than surface area.

To plant, fill the hole-less aquatic pot with 2-3" of heavy topsoil, placing the fertilizer in the bottom of the pot. Unlike the marginals you planted in the gravel, you will need to fertilize these plants as they are not as effective at drawing nutrients from the pond because their roots are contained by the pot.

Finish filling in around the plant's roots with heavy topsoil. Then fill the pot to within one inch of the top, firmly pack the soil, and cover it with a ½ to one-inch layer of gravel. Remember, when you're done, the gravel level should be about even with the previous soil level.

Continuing Maintenance

Taking care of marginal plants in an ecosystem pond is fairly simple. Remove any dead, discolored, or excess plant material as needed. Marginal plants (unless they are in pots) do not need to be fertilized, as they will flourish from the nutrients in the pond.

For winter care, simply cut the plants back to two or three inches above the water level of the pond. In the spring, remove all dead plant material. And remember, the growth of plants that are directly in the gravel is not restricted – they will need to be thinned so they don't engulf more of the pond than originally planned.

A Final Note

The flowering waterlily may be the apple of your water gardening eye, but marginal plants play a crucial role in the function, maintainability, and beauty of a properly-conceived water garden. Without marginal plants, the water garden will look out of place and unnatural. They provide many textures, colors, and blooms that soften the edges and help blend the pond into the surrounding landscape. So when you're in the planning stages of a water garden project, don't forget the marginals because they're simply part of Mother Nature's recipe ... and we all know better than to argue with her.

Article Source

Aquascape, St. Charles, IL, USA. www.aquascapeinc.com.



Known as a vector for the West Nile virus, this *Culex quinquefasciatus* mosquito has landed on a human finger. Photo by Jim Gathany, commons.wikimedia.org.

Research Update Pond Dye and Mosquitoes

by James Allison

Recent research in the UK has flagged some interesting findings on the behavior of the local *Culex* mosquitoes in respect to the pond dyes used in ornamental ponds.

It seems that female mosquitoes prefer to lay eggs in darker water. In experiments, the dyed test water had significantly more eggs laid in it.

From reading the article, I'm assuming that the dye tested was the very dark water type sold in the UK for small ornamental pools (rather than the less black, 'shadow' dyes used to reduce algae in larger pools).

As always, the headline result isn't all the story. The eggs laid in the dark water didn't always fare as well as those laid in the clear water. The number of larvae/pupae hatching didn't show as clear a difference between dyed and tap water, and fewer adults emerged from the dyed water. This suggests further research might be of use to highlight what exactly is going on.

See the original study at:
<https://peerj.com/articles/3361/>.

About the Author

James Allison is with Aquapic Water Garden Solutions and is on the IWGS Board of Directors.

IWGS Symposium 2017 Updates and Schedule

by Kelly Billing

In the last issue, we shared details on the 2017 Symposium speaker program, garden tour destinations, and are attractions. Here is the finalized schedule and some updated details. We hope you can join us!

Earlybird Discount Deadline

The deadline to sign up for the 2017 IWGS Symposium at the reduced earlybird rate is fast approaching on Saturday, July 8, 2017. Register now at: iwgs.org/iwgs-2017-symposium-registration-page/.

Accommodations

We will meet at the Wyndham Garden Glen Mills, Wilmington 1110 Baltimore Pike, Glen Mills, PA 19342. The hotel is minutes away from I-95, near downtown Philadelphia, and the Philadelphia Airport. For reservations, call 610-358-1700 (ask for Ryan Simkins at ext. 2132 and mention IWGS) or go to <https://www.wyndhamhotels.com/groups/iwgs-annual-meeting>. Our group rate is \$134.95 per night including a hot breakfast, and the rate is good for both pre- and post-meeting dates.

Transportation from Philadelphia International Airport to the hotel can be via Taxi, Uber, or Lyft. A Lyft estimate was \$30.00-55.00 depending on how many passengers...the more passengers the lower the cost per person.

Coach/shuttle buses will pick up everyone at the hotel each morning (Wednesday-Friday) to bring them to the day's programs.

Symposium Schedule

Tuesday August 8th Register and Meet-and-Greet

- IWGS Board of Directors Meeting open to the public at the Wyndham Garden Glen Mills.
- Register, mingle with friends and enjoy light snacks at the Wyndham Garden Glen Mills.



Longwood Garden's waterlily pools. Photo by Kathy Jentz.

Wednesday August 9th Shopping and Tours

- Terrain at Styers
Be ready to be inspired; creativity on another level. Terrain at Styers is a wealth of design, style, and innovation in outdoor living. Garden related wares, rare plants, landscape services, gifts, and decor for the most discriminating taste.
- Local Private Water Gardens
Becky, Jason and Sarah Turpin from Turpin Landscaping are treating us to a surprise tour of local gardens that are special in every sense of the word.
- Chanticleer
Chanticleer will host/sponsor dinner. Chanticleer is one of the great gardens of the region. Once the Rosengarten estate, today's Chanticleer is a colorful, contemporary garden within an historic setting. Come discover why London's *Financial Times* calls the garden "planted to perfection" and *Garden Design* magazine says they are "America's most inspiring garden."

Thursday August 10th Tours and Talks

- Longwood Gardens

One of the world's great gardens, Longwood's story is one of legacy, innovation, and stewardship. History, horticulture, education and a vision for the future.

- Exclusive Access Sunrise Photo Shoot at the Waterlily Pools

- Annual General Meeting

- Yu Cuiwei will discuss Cold Stress Tolerance Gene Transformation of Tropical Waterlilies. The company Zhejiang Humanities Landscape Co., Ltd. has been researching it for many years, and they are looking forward to sharing their work with attendees. A very special experience for the advanced plant lover.

- Laura Bancroft, Ten Mile Creek Nursery. She is a nine year experienced lotus grower with over 200 varieties. Her wealth of knowledge is an extension of her work in cooperation with The Lotus Project at Auburn University.

- Main Fountain Pool

The 90 Million Dollar Renovation has reached new heights; Longwood's largest project in the gardens' history. Plumbing at a higher level with over 1,700 fountain jets and streams. An opportunity to get inside information on this massive undertaking.

- Tim Jennings' Waterlily Talk at the Pools and New Waterlily Competition

Tim Jennings is a graduate of Longwood's Professional Gardener Training Program and is the Senior Gardener responsible for Longwood's outdoor Waterlily Display, Fern Passage, and Rose House. He is also responsible for the New Waterlily Competition for the IWGS held at Longwood.

- Anthony Archer-Wills is a genuine plants-man and inspiration to so many in this industry. He will address waterlilies full circle, "It was Patrick Nutt and Longwood Gardens that moved my love of the waterlilies forward in a quantum leap!" Anthony's water features are world renowned! His plant knowledge, use in the landscape and attention to detail is like no other.

- Stanton Gil University of Maryland Cooperative Extension, Aquatic Plant Pest Research. Maryland nurseries know what an amazing resource they have in the University of Maryland system.

- Expert Panel Discussion on Waterlilies with Tamara Kilbane, Senior Horticulturist, Aquatics at Denver Botanic Gardens and the International Waterlily Registrar Tamara will be turned moderator to cover the realm of waterlilies from basic to advanced. What's new and the Panels favorites! Panelists: Tim Jennings, Longwood Gardens; John Sou, Watergarden Paradise Aquatic Nursery (Australia); and Danny Cox, Naples Botanic Garden.

- Victoria Talk with Tim Jennings and evening around the waterlily pools stroll the water gardens and enjoy the night bloomers.

Friday August 11th Tours and Banquet

- Mt. Cuba Center

Gardening on a higher level, Mt. Cuba Center inspires an appreciation for the beauty and value of native plants and a commitment to protect the habitats that sustain them.

- Winterthur

Winterthur is set amidst a 1,000-acre preserve of rolling meadows and woodlands. Designed by Henry Francis du Pont, its 60-acre naturalistic garden is among America's best, with magnificent specimen plantings and massed displays of color. He selected the choicest plants from around the world to enhance the natural setting, arranging them in lyrical color combinations and carefully orchestrating a succession of bloom from late January to November. Du Pont translated his love of the land into a unified work of art that embodies a romantic vision of nature's beauty.

- North Creek Nurseries Happy Hour

North Creek Nurseries' mission is to propagate and market plants that develop the relationship between people and sustainable outdoor environments. Their vision is to be, in their customer's judgment, a leader in the development and practice of sustainable horticultural systems, producing world-class plant material. Their values include working in and promoting sustainable environments while delighting our customers and providing opportunities for continuous learning.

- Banquet Dinner at Concordville Inn

Kathy Jentz edits the quarterly *Water Garden Journal*, the official publication of the International Waterlily & Water Gardening Society. Kathy is currently the Green Media columnist for the *Mid-Atlantic Grower* newspaper, where she does a great deal of hand-holding and coaxing to get independent garden centers, plant breeders, and other horticultural businesses to join the social media revolution and maximize their online brands. She will speak on “Social Media for Horticultural Professionals.” She will cover Twitter to Houzz and beyond.

- Accolades for Patrick Nutt Scholarship by Paula Biles

- Certificates of Recognition by Tamara Kilbane

- Live Auction with Gary Jones as auctioneer



Morris Arboretum. Photo by Kathy Jentz.

Saturday August 12th Post-Program Tours

- After-Symposium Ideas

Here is a list of places in the Mid-Atlantic region worth visiting for those who want to hang around. (Also, you might consider some of them for pre-program visits).

~ August 12th is the Fireworks Fountain Show at Longwood Gardens. Tickets must be purchased in advance.

~ Phillips Mushroom Farm in Kennett Square, PA, the largest specialty mushroom grower in the US.

~ Bartram's Garden, Philadelphia, PA, botanic garden nearby.



Ladew Topiary Gardens. Photo by Kathy Jentz.

~ Morris Arboretum of the University of Pennsylvania, Philadelphia, PA, botanic garden nearby.

~ Splash Supply, York, PA, pond specialty store.

~ Tilley's Nursery, Coopersburg, PA, pond specialty store.

~ Turpin Landscaping, Coatesville, PA, pond specialty store.

~ Scott Arboretum of Swarthmore College, botanic garden nearby.

~ Ladew Topiary Gardens, Phoenix, MD, botanic garden.

~ Maryland Aquatic Nurseries, Jarrettsville, MD, wholesale grower.

~ Lilypons Water Gardens, Adamstown, MD, pond specialty store.

~ Brookside Gardens, Wheaton, MD, botanic garden.

~ Kenilworth Aquatic Gardens, Washington, DC, botanic garden specializing in lotus.

~ The National Mall, Washington, DC, museums and national monuments.

More details and a registration form are available at IWGS.org. Act fast to secure your spot.

About the Author

Kelly Billing is with Maryland Aquatic Nurseries, Inc., and is on the IWGS Board of Directors.

Events Calendar

Here is a listing of water garden-related events from July 1, 2017, to April 1, 2018, taking place around the world. If you would like to submit water garden events for the next edition of the *Journal*, please send your listing before September 1 to KathyJentz@aol.com.

Annual WaterLily & Lotus Festival

July 15, 2017

Washington, DC, USA

Held at the Kenilworth Aquatic Gardens. There'll be music, cultural arts and crafts, live animal exhibit for kids, and more. The lotus and waterlilies will be in full bloom throughout the seven acres of the National Park Service's only site dedicated to aquatic plants. More information: www.friendsofkenilworthgardens.org

Lotus Jazz Night

July 22, 2017

Washington, DC, USA

The second annual Lotus Jazz Night held by the Friends of Kenilworth Aquatic Gardens, National Capital Parks-East, featuring live jazz. Bring a blanket and picnic to enjoy this show along with the jaw-dropping backdrop of the gorgeous American lotus. See www.friendsofkenilworthgardens.org.

International Botanical Congress

July 23-29, 2017

Shenzhen P.R., China

The 29th International Congress will be held Shenzhen China (<http://www.abc2017.cn/>), and The 2017 China National Lotus Show and International Lotus Symposium will be held in Suining of Sichuan and Kunming of Yunnan respectively.

MN Water Garden Society Tour

July 29-30, 2017

Minneapolis and St. Paul, MN, USA

The Minnesota Water Garden Society hosts its 20th annual water garden tour hours are 9 a.m. to 5 p.m. both days. The self-driving tour features about a dozen water gardens in the Twin Cities metropolitan area. By early summer, descriptions of the sites, a map, and information about ticket prices and how to purchase them will be available at www.mwgs.org.

Denver Water Blossom Festival

August 5, 2017

Denver, CO, USA

Denver Botanic Gardens and the Colorado Water Garden Society will again co-host the annual "Water Blossom Festival." Tours of the water gardens, Japanese Garden, and Bonsai Pavilion will be offered. See <http://www.colowatergardensociety.org>.

LilyFest 2017

September 23, 2017

San Angelo, TX, USA

The free event will be held from 9:00 am to 2:00 pm. There will be tours, seminars, a plant sale, food, and entertainment on site as well. You will see more waterlilies on display than at any other garden in the USA. For information, go to: <http://www.internationalwaterlilycollection.com/>.

Aqua 2017

October 18-19, 2017

Telford, England, UK

AQUA 2017 is the UK's largest aquatics and water gardening trade show. See details at: <https://www.aquatelford.co.uk/aqua-2017-visiting>.

Philadelphia Flower Show 2018

March 3-11 2018

Philadelphia, PA, USA

The 2018 PHS Philadelphia Flower Show, "Wonders of Water" will celebrate the beauty and ingenuity of water gardening. To be held at the Pennsylvania Convention Center. See: <https://theflowershow.com>.

Koi Shows in the USA

- July 22-23/29-30 27th Midwest Pond & Koi Society Pond Tour, Chicago, IL, mpks.org
- July 28-30 6th Tri-State ZNA Koi Show, Staten Island, NY, facebook.com/TriStateZNA/
- Aug. 4-6 11th Upper Midwest Koi Club Show, Minneapolis, MN, uppermidwestkoiclub.org
- Aug. 24-26 6th Michigan Koi & Pond Club Show, Milford, MI (Detroit area), mkpc-se.com
- Sept. 8-10 23rd ZNA Potomac Koi Show, Vienna, VA (Washington, D.C. area), znapotomac.org
- Sept. 16-17 16th Northern Midwest ZNA Koi Show, Carmel, IN (Indianapolis area), nmzna.net

Online Community

Hail Storm Kills Fish

by Kathy Jentz

Here is a recent discussion from the IWGS Let's Talk Water Gardening on-line forum (yahoo group). You can find out more and/or sign up to this group at: <http://groups.yahoo.com/group/LetsTalkWaterGardening/>.



Question posted by Mike Welsh, Takoma Park, MD, USA:

After the violent hail, wind and heavy rain storm on Friday early evening, I lost all of my pond's koi and carp fish; probably a total count of fifty (50). Having left work late that evening and as we were losing good light, I arrived home and not discover any major disturbance or concerns to my gardens and property. We had electric power, so my pond pump had continued to function, so I only glanced at the pond area. As I let my dogs out Saturday morning into the my small backyard, something said to me; take a look at the pond, but no more than usual as I would have after other significant size storm. Then, I saw about 15 to 20 pond fish, including both of my large koi, just floating and assumed dead. At closer inspection, probably 35 fish were dead, some close to the surface, but not breaking completely through. Two fish were actually moving, but one showed signs of having problems with alignment, but by 11:00am; both died. By the next morning, there were about 15 more fish that either float to the top or were hung or tangled on pond plants as I removed them.

My assumption is whatever caused this fish killing hit them as they were located or some tried to go deeper to the bottom of the pond to avoid. When I first, around 9:00 am, realized that there was shredded plant and tree leaf litter on the surface of the pond along with other emerging pond plants, I removed as much as I could, but some litter fell to the bottom of the pond. I haven't filtered this pond for years, but utilized two stone pumps and there is always, even in the coldest winters, water movement via a circulating water fall. The only other problem such as this one was more than 20 years ago when before I set up (at that time, I utilized a heater to allow air exchange) for winter, we had an early December solid freeze and, at that time, I lost just koi, but all of the carp survived. I assumed that it was the oak leaf toxicants or gases in the water and lack of oxygen to the fish that caused their death.

At this time, all of my frogs including tadpoles appear to have survived and their activity appears to be normal. I assume that toxicants caused by leaf litter which in my pond this time included oak, magnolia, crape myrtle, and buckeye will disperse over time and was of much higher intensity on Friday. I don't know if anyone can help to resolve this occurrence or determine a resolution, but I would welcome any and all comments.

Response from Tamara Kilbane:

The sudden drop in pond water temp from the hail was probably the cause of the fish kill. Sorry to hear

Response from Doc Vicki:

A friend had this happen too, we had the same hail that time and no fish losses. Things we theorized: Abrupt change in water temperature, chemistry. Floating plant material, hail interfering with oxygen exchange. Concussive injury (didn't seem likely). He also lost all fish. His pond has less surface area and more depth. I have a shallow pond with a lot of surface area. Anyway, still a mystery to me.

Response from Murali, Bangalore, India:

I lose my carp and goldfish in my pond during a hailstorm... I think it's due to the sudden lowering of the water temperature and the ice hitting the fishes with great force?

Response from Mary Traveland:

Does Mike have an autofill? The liner could have been punctured and the autofill kicked on, possibly chlorinat-

ing them. The largest would die first, and the others if no corrective action was immediately taken. The frogs would be fine.

My liner was actually punctured multiple from an intense hail storm in Texas last year, up to 2' below the water surface. Ice balls beside the pond were a foot deep, so lots had to be in the pond also. I lost no fish. I did have to reline my pond and make sure the rock overhang was more pronounced.

Response from Kelly Billing:

In a deeper water.....maybe? ee:

~ <http://muskingumswcd.org/wp-content/uploads/2016/10/OSU-Winter-and-Summer-Fish-Kills-in-Ponds.pdf>

~ <https://appliedecology.cals.ncsu.edu/wp-content/uploads/Understanding-Pond-Stratification-OSU-Extensipn.pdf>

Response from Jim Purcell:

Lack of oxygen in the water due to a mixing of low oxygen water at the bottom with the higher oxygen water near the surface? This is not a very satisfying explanation, as this time of year the water at the bottom should still be holding more oxygen, and the air stones and waterfall should be preventing this, but it is still the most likely explanation. Perhaps the amount of water circulation was inadequate for sufficient oxygenation at the bottom, or perhaps the water for the waterfall is not recirculated in such a way as to replace water at the bottom with fresh water.

The warm water at the top of the pond became colder than the water at the bottom with the introduction of hail and cold rain water, causing mixing as the now colder water at the surface sank. This would be more of a problem for deeper ponds, ponds without circulation, and ponds with a lot of detritus on the bottom. This is consistent with frogs and tadpoles being unaffected, as frogs take oxygen from the atmosphere, and tadpoles will gulp air from the surface as well.

Response from Hill Country Water Gardens & Nursery:

Maybe they were electrocuted? Lighting?

Response from Rick Weidman:

There may be several reason why this happened, but it was likely due to a combination of low oxygen levels and accelerated drop in water temps. Here are some things to consider:

- Water can hold only a limited amount of dissolved oxygen. That is determined by factors such as atmospheric pressure, temperature, and even salinity. Properly sized diffused aeration (resulting in maximum surface tension disturbance) will help keep dissolved oxygen levels as close to the full saturation point as possible.
- The amount of oxygen in water is measured as milligrams per liter (mg/l) or parts per million (ppm) dissolved oxygen (DO).
- A water molecule's ability to absorb dissolved oxygen from the atmosphere increases as atmospheric pressure increases and vise-versa.
- The atmospheric pressure before and during an extreme hail storm typically drops significantly, lowering the water's ability to absorb oxygen, resulting in lower dissolved oxygen levels in the pond, even with adequate surface tension disturbance from water and/or diffused air circulation.
- Photosynthesis accounts for a good portion of the dissolved oxygen in water. The dark periods before a storm obviously reduce photosynthetic activity.
- Fish kills are relatively common in large natural ponds over 6-8' deep after extreme rain or hail storms (usually in the heat of summer when water temps can exceed 86°F). The water temps drop quickly and the thermocline shifts causing "turn-over". The same can kind of happen in a relatively shallow Koi pond. Properly sized aeration prevents this from happening because it helps equalize DO and temperatures throughout the water column, and will maintain higher DO levels prior to the storm that help fish weather these storms.
- 5 ppm DO is considered the minimum for healthy , safe fish. At low 4 ppm - 3 ppm fish will begin to stress

and die. Properly sized diffused aeration will typically increase DO levels to 6, 7, 8, 9 ppm, depending on overall demand (BOD).

Sometimes even best practices don't stop the forces of Mother Nature, but hopefully it will most of the time.

Response from Jamie Beyer:

There are some great thoughts on why these koi died. It is possible that any one of them killed them, but I do not think that so. Let me explain.

I have seen this kind of loss before in a pool of trout at a hatchery in Iowa. After a large storm moved through—an entire pool of trout had died during the night. There were perhaps 40 to 50—approx. 2 foot long breeder trout that the hatchery was using. Simply beautiful fish and it was their entire breeding stock for that spring. I was there late afternoon when the storm hit and there was lightning hitting the ground in the area. There was hail, but not large. An inch of rain about. Because of the storm I was not able to complete my tour of the hatchery so I stopped back early the next morning and saw the dead trout in the pool. The hatcher manager was there then. He was frantic—loading the dead trout into a tractor loader. Huge loss for them. He said lightning caused their death.

I do have some questions—was there lightning in the area? How big was the hail? To have punctured holes in the liner—that hail would have had to be big and even then, I cannot see the hail creating holes in the liner. How much hail was there? Was there an inch of ice on the ground after the storm or what? To have lowered the pond temp to kill fish—it would have to be a lot.

The huge increase in shredded organic matter is an interesting thought on killing the fish due to lack of O₂. For this to have occurred - the bacteria that decomposes organic matter would have had to proliferate -- then the organic matter would have had to start to decompose. The excess bacteria needs O₂ and this robs the water of the O₂, of course. For this to have occurred overnight—I do not think so—especially since power was not lost and pumps were running.

I am fairly certain it would have been lightning. The one fish that had “problems with alignment” really points to lightning as well.

Look up lightning damage on fish—you will find S shaped fish (curved spine). I have a large Koi that this has occurred to -it is still alive after 2 years but it is still S shaped. It swims funny but it overwinters outside in my ponds in the Midwest. So it is otherwise healthy.

Response from Anonymous:

I thought the nitrogen from hail in water is what killed the fish.

Response from Barbara Davies:

All great comments on this fish death. Science matters! Barometric pressure changes can have an effect. Years ago, at Etablissements Botaniques Latour-Marliac, in southwestern France, a freak, late-spring hail storm passed through the region. It destroyed protective netting over neighboring apple orchards. It broke up glass and plastic in a couple of our shade and other structures. It ripped up all the *Nymphaea* and *Nelumbo* leaves. We did not have any fish other than Gambusia, so no notable deaths there. Even a day's drive away, trees had been denuded and branches downed. We heard local comments that the hail stones had been much larger than golf balls. Nature's mysteries...

Another thought...trees. With Santa Barbara Water Gardens maintenance services, “back in the day,” we never had any problems, ever, with quantities of oak leaf, flower, pollen, etc, of which there was plenty. We even made pillows of oak leaves and/or pine needles to throw into ponds to clear the water of single celled pree floating algae, with all manner of fish present. Buckeye, however, is toxic. The initial enquiry mentioned Buckeye.

About the Author

Kathy Jentz is editor of *The IWGS Water Garden Journal*. She can be reached at kathyjentz@aol.com.

Member News

Waterlily Donations Made to NY Botanical Garden

By Charles W. (Chappy) Frase

Five waterlily cultivars of my father, William C. (Bill) Frase, were donated to the New York Botanical Garden (NYBG). They are to celebrate his life's passion of cultivating and hybridizing tropical waterlilies. We look forward to seeing the lilies in bloom as a complement to the Chihuly Glass exhibition, running until October 29, 2017.

I had originally hoped to donate his plants in 2012 to celebrate his 100th birthday anniversary. Unfortunately, life got in the way. So, this year, I attempted the project with the invaluable help of Paula Biles, without whom I could not have succeeded, and as well of the author Teri Dunn Chace.

We were able to find and get donations for five of his X hybrids: 'Lou Pignolet,' 'Electra,' 'Purple Zanzibar,' 'Laura Frase,' and 'Teri Dunn.' This was possible thanks to the efforts and generosity of Derek Lyle (Missouri Botanical Garden), Brad McLane (Florida Aquatic Nurseries), Jim Purcell (Oregon Aquatics), and Tamara Kilbane (Denver Botanic Gardens).

Now Bill Frase's lilies will join the New York Botanical Garden in the tropical conservatory pool next to the hardy lily pool containing cultivars of his friend Perry Slocum.

My father was also an artistic aquatic landscape designer. Our home in Orlando, FL, was a beautiful park admired by many visitors over the years. The International Waterlily & Water Gardening Society (IWGS) even hosted a field trip to show off its beauty and Bill's waterlily expertise. He loved sharing his knowledge with any enthusiast. Many considered him their mentor and he undoubtedly started several people on a wonderful avocation or careers in the aquatic business.

In 1998, my father was elected to the IWGS Hall of Fame. He passed away in 2003. Fortunately, we were able to find friends to accept his plants in order to preserve the majority of his hybrids. I am glad that he



Photo courtesy of C. Frase.

did not experience the destruction of our gardens by the three 2004 hurricanes.

I would still like to find his hybrids 'Enid Frase,' 'Bill Yohn,' and 'Floyd Wolfarth.' If anyone knows of a source(s) please contact me at cfrase@compuserve.com.

Be sure to visit the New York Botanical Garden to see the waterlily collection as well as the Chihuly exhibition currently in progress.

About the Author

Charles W. (Chappy) Frase is the son of William C. (Bill) Frase. He remembers with great affection and joy helping Bill in the gardens and waterlily pools of the Orlando home and talking philosophy while working together. He is retired now and spends his time working in his own gardens and can be reached at cfrase@compuserve.com.

Expert Corner

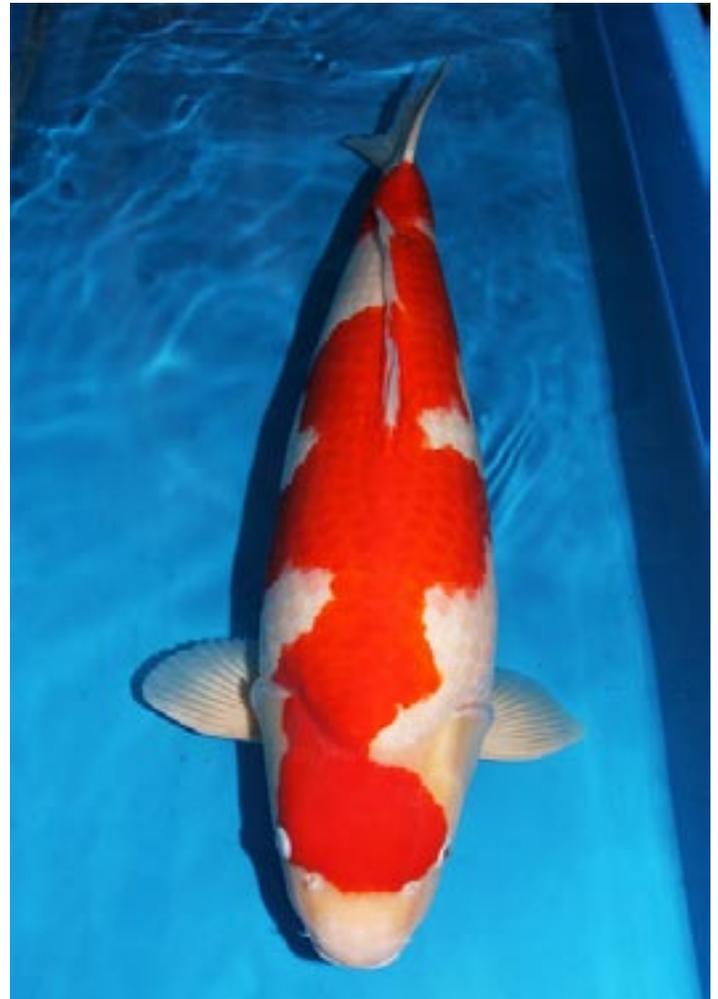
Kohaku Japanese Koi Fish

by Mike Gannon

Kohaku (pronounced: ko – ha – koo) is a Japanese word that can be defined as meaning red (ko) and white (haku), or it can mean amber the color as well as the gemstone, Kohaku can be a Japanese boy or girls name; it is also a variety of koi fish. Let's stick to talking about the koi...

The Kohaku is a scaled or scaleless type of ornamental koi with a white body and one or more red blotches or patches to create it's pattern. The simplicity of colors in this variety of koi is also it's complexity. Kohaku come in many varieties such as butterfly, gin rin, doitsu, and tancho. Tancho may be one of the most sought patterns of Kohaku with its pure white body and only a circular spot of red on the head of the fish. Tancho is a very symbolic koi variety representing the pattern of the flag of Japan. The Kohaku's symbolism is literally skin deep with the white color of it's body representing the purity of white, like the snow; and the color red representing the sun to the Japanese. The combination of red and white colors in Japan are used for many special occasions. The combination of red and white is used by Japanese koi breeders to win koi competitions too. Kohaku are no strangers to being named as Grand Champions at koi competitions around the world; making them one of the most valuable varieties of koi. Becoming Grand Champion is a special occasion that should be celebrated with red and white!

Koi keeping is a journey. Its a journey that has been labeled a hobby. Journeys are long term quests, often times complex, with expectations for the unexpected and discoveries happening along the way. A trip to the supermarket is not a journey (unless you're my wife), and a trip to the supermarket cannot be epic (again...). When it comes to the koi keeping journey, the journey can and at times does become epic. Can the purchase of a small koi possibly turn you into a world traveler, learning a new language, or watching the sunrise in Niigata Japan? Yes, the koi keeping journey can do that. It is said that the koi keeping journey begins with



Tomahawk inazuma Kohaku purchased by Danny's Koi Cafe from Belgium. It is 72 cm long. Photo by KoiQuestion on Flickr.com.

Kohaku, and it ends with Kohaku. That is a beautiful sentiment.

To appreciate the beauty of Kohaku it is good to understand the incredible lengths that were gone through to create such a simply complex pattern that the breeder artists created. The koi journey may have begun with Asagi. Asagi is the first koi variety from which it is believed all other koi varieties are stemmed from. Asagi is a beautifully scaled white koi with blue and red markings. That red coloration of the Asagi is believed to have given rise to the Kohaku, however there are varying accounts of how and when Kohaku came to be.

Let's go back to the basics of the Kohaku being a white-skinned fish. White-skinned fish are extremely

rare, almost nonexistent in nature. In natural conditions white skin is a liability to a fish since it is highly reflective they can become easy prey for many types of predator. There are many fish that have some white on them in nature, and of course there are albino fish but albinos are considered genetic “defects.” The creation of a white fish was a long, painstaking process that took many generations of koi to produce. The creation of a white skinned fish with red patches was a slow, methodical, intentional process; resulting from generation after generation of meticulous culling.

Kohaku are among the earliest varieties of koi. Kohaku are also one of the “Big 3” grouping of koi known as Gosanke and is made up of Sanke, Showa, and Kohaku. Within the Kohaku grouping there are different varieties of Kohaku. As mentioned earlier there are the Tancho variety, there are also 1-Step (Ohmoyo), 2-Step (Nidan), 3-Step (Sandán), 4-Step (Yondan), and so on. The “steps” equate the number of red patches on the koi. A Kohaku with 3 distinct red patches would be described as a 3-Step variety of Kohaku; and so on. Even the Step patterns can be recognized and named based on the shape of the red patches as well; a zig zag or lightning shaped Step pattern would be called Inazuma. There is also a cherry blossom pattern.

Kohaku are unmistakable fish and easily appreciated by even the newest eyes in the hobby. But what makes up a high quality Kohaku? Here is some criteria:

- the white color must be pure white, no pinkish or yellow hues
- the red color must be thick enough to hide scales on the fish
- there cannot be “bleeding” of colors from the red patterns onto the white skin
- spots or freckling is undesirable
- there should be no red in the fins of the fish
- scales must be evenly and cleanly distributed over the body
- patterns must be large and well balanced over the body, and begin on the head
- conformity is critical, not too big or small, no blemishes, no abnormalities, nice torpedo shape, well-balanced and ratioed body parts
- a beautiful smile ..(ok, I made that one up)

No koi collection would be complete without Kohaku. Kohaku don’t require any special care beyond the typical requirements for koi keeping, and of course they are peaceful fish mixing well with any type of koi and most ornamental pond fish. They are cold tolerant and can be kept outdoor year round even in colder zones. Kohaku are easily found and widely available on a global scale with breeding occurring on almost every continent. Great looking Kohaku can be easily found at water garden centers for the typical backyard pond. High-end and show-quality Kohaku are best acquired through reputable breeders specializing in Kohaku. These breeders will often provide blood line certifications to accompany your investment in show quality koi.

Maybe your Kohaku is on your passenger seat as you drive home from the local garden center, or maybe it is next to you in the airplane while you fly back from Japan with your newly acquired champion blood-line tosai* Kohaku. The appreciation of Kohaku is so simple and so complex that the saying holds true; “The koi keeping journey begins with Kohaku and it ends with Kohaku.”

About the Author

Mike Gannon is owner of Full Service Aquatics located in Summit, NJ. Mike is an award-winning pond, water garden, and water feature builder. Mike is the creator of “The Pond Hunter” video series seen on Youtube and has made several television appearances on networks such as HGTV and the DIY Network. He also hosts the Pond Hunter Radio Broadcast. You can contact Mike at the LOVEYOURPOND blog at <http://fullserviceaquatics.com>.

*Tosai’ is a young/first-year koi.

THE WATER GARDEN JOURNAL

Volume 32 Number 2

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The Official Publication of the
INTERNATIONAL WATERLILY AND
WATER GARDENING SOCIETY

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An indoor water garden feature at Meadowlark Botanical Gardens, Vienna, VA, USA. Photo by Kathy Jentz .

Mission Statement—The International Waterlily & Water Gardening Society (IWGS) is a nonprofit organization of multi-national membership dedicated to the furtherance of all aspects of water gardens and their associated plants. As an organization we support and promote education, research, and conservation in these areas.

Volume 32, Number 2 *The IWGS Water Garden Journal* (ISSN 1069-5982) is published quarterly by The International Waterlily and Water Gardening Society (The Society), P.O. Box 546, Greenville, VA 24440, USA. Phone 540-337-4507, Fax: 540-337-0738, Email info@iwgs.org. All rights reserved. © 2017. The Water Garden Journal is indexed in EBSCO's Garden, Landscape & Horticulture Literature Index.

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