2001 AN EXCITING NEW YEAR

The CWGS will have a very active and interesting series of guest speakers this year. In addition to our annual symposium, scheduled for April 8, the Denver Botanic Gardens, we will have three highly interesting and informative presentations at our regular membership meetings on March 11, May 20 and August 12, 2001. The March meeting will be in the new Gates Building at the DBG. The others will be held at the Morrison Center and the general meeting will be held each of these Sundays at 2:00 p.m.

The first speaker will be Anthony Smith of Quality-Water Biosystems in Broomfield. Anthony gave a presentation two years ago at Hudson's Gardens on algae that was well received. This year as our kick-off speaker Anthony will give a presentation including slides entitled "Now Is the Time". The talk will cover topics related to what you can expect to find in your pond after the long winter and how to approach getting the pond ready for spring and building a healthy pond environment.

On May 20 we will have Dan Byrne of Suwannee Labs, Inc. in Lake City, Florida. Dan is a renowned expert in tropicals and some of you may know him for his involvement in organizing trips to the Amazon to see the Victoria Lily. He will give a presentation on new tropicals and hardy marginals including slides. The discussion should be a good one to start off the growing season and give you all ideas for the summer.

Our speaker on August 12 is Richard Koogle of Lillypons. Richard has been with Lillypons since 1979 and has an extensive background in all aspects of water gardening. He will present a slide show covering a wide array of topics including species of lilies and other water plants, maintenance and winter care. This will be a very timely presentation as our season comes near an end.

Finally, I need to remind all of you about the symposium that will be held on April 8 at the DBG. We will have nine presentations scheduled over the four hours. We will continue with presentations on pond construction and installation, maintenance, fish, plants and propagation and containers. We will be adding new areas including aquatic and wetland construction. There is no charge for members and if the turnout is anything like last year we will have a very good experience. I hope you all can attend and will have a chance to meet and discuss concerns, issues and successes you have had with the presenters and participants.

This will be a very active year for programs and I have not even mentioned the pond tour. This year we will see ponds in the Golden and Arvada area. But more on that as the tour shapes up. Comes to the meetings and enjoy the variety of presenters and topics we have for this year.

THANKS FOR YOUR SUPPORT

Below is a list of vendors who donated gift certificates and merchandise, ranging in value from $15 to $40, for door prizes for our December party. We thank them sincerely for their generosity. We encourage all our members to support our vendors.

Ron's Golden Ponds
11190 W. Colfax Avenue
Lakewood, CO 80215

Echter's Greenhouse & Gardens
9170 W. 52nd Avenue
Arvada, CO 80002

True Pump & Equipment, Inc.
1429 S. Broadway
Denver, CO 80210

City Floral Green House
1440 Kearney
Denver, CO 80220

Thanks: to our member volunteers who participated in the Garden and Home Show.

Your Keepsake handout will start next month and will discussing marginal water plants.
Here we are on the doorstep of a new season. Already, many of you are looking around the yard to see where the next pond or container is going to fit. If you truly have run out of room and just need to exercise your right to increase the number of blooming lilies, we'll be planning a number of volunteer planting activities this year. You won't have to miss out!!!

Make sure to complete and return your renewal application, so you will be contacted on the various volunteer opportunities that match your interests.

I'd like to thank Board Members and Committee Members for all their hard work this past year. Also, I'd like to thank the hard working volunteers who assisted last year. We'll all be looking forward to a successful year!!!


Sunday - All Season:_cleaned-up and fertilized plants: Len Freestone, Doris Freestone, Donna Nelson, David Nelson, Margaret Oleson.

Spring & Fall Volunteers at DBG: Ron Bice, Alice Campbell, Inus Alfonso, Steve Carson, Rose Carson, Lowell Coon, Larissa Coon, Deanna Davis, Larry Davis, Bryan Counce, Michael Gibson, Tim Gilbert, Damon Gunn, Gail Goldberg, Jim Haggard, Jan Haggard, Bob Hoffman, Doug Ingenthal.

Sale and other Volunteers: Jim & Tudi Ames, Maurice Behle, Ron & Betty Lou, Bissunnette, Steve Forgy, Debra Foster, Neil Littlefield, Al Mayer, Pam Maxwell, Mary Mirgon, Rebecca Nash, Anna Nunn, Mary & Charles Purdy, Mary Shaver, Keith Staples, David Schutlz, Troy Stover, Paul & Rose Sweeney, Mike Thomas, Andria Thomas, Leda Van Stedum, Ellen Westbrook.

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GREAT LOTUS SALE

Watch your mailboxes for our GREAT LOTUS SALE in March. Order forms will be mailed mid month and will require the completed form and partial payment returned within 7-10 days. Again this year we will be offering many varieties and some very insightful information on growing. This new growing information is based on historic information from the late Louis Liebhardt of Rose Acres. His beautiful garden had nearly 36 acres filled with with an estimated 10 acres of lotus blooming July - September to the great pleasure of visitors. The 14 lakes and ponds at Rose acres were said to sport 600,000 lotus blossoms each season. It would appear he knew some secrets, we will share with members.
CONTROLLING GREEN WATER IN ORNAMENTAL PONDS

By Stephen M. Meyer

If there is any single problem shared by ornamental pond owners around the country it is green water: the UNCONTROLLED growth of suspended algae. I emphasize adjective "uncontrolled" because some level of suspended algae is desirable. Pond water should always have a slight greenish tinge, but seeing should be unimpaired to 2 feet below the surface. While "pea-soup" thick green water may be attractive and desirable in ponds and pools dedicated to flora (it masks all the planting pots and gives an natural appearance), it is frustrating for koi and goldfish aficionados because it hides the fish.

Aesthetic issues aside, green water is also a serious impediment to maintaining good health conditions for ornamental fish. First, the greatly diminished visibility below the water surface makes early detection of disease and parasites impossible. In a pond this spells disaster; for reasons of both purist and effectiveness it is clearly preferable to treat a single fish outside the pond rather than to medicate an entire collection in the pond.

Second, and equally serious, algae consume a substantial amount of oxygen at night. Measurements confirm that during hot summer nights the oxygen consumption of suspended algae is sufficient to drop pond dissolved oxygen levels below the minimum necessary to sustain goldfish and koi. Thus, many a pond owner has woken up the morning only to find many of his/her prize fish dead in the water -- even though aerators and filters were working!. The largest -- and therefore more valuable fish -- always are the first to die. Some assume that vandals dropped poison in the pond -- or that a mysterious disease was introduced. In fact the culprit is oxygen depletion; the larger fish suffer proportionately more.

Third, uncontrolled algae in the pond can lead to wide fluctuations in water pH, with a general trend towards increased pH (greater alkalinity) over time. This is not conducive to good fish health.

Obviously, the elimination of excess suspended algae is an vital part of the pond culture of ornamental fish.

Green Algae

Our prime interest is in green algae (Chlorophyceae) -- a freshwater plant with over 5000 species. Algal spores are present in all water, waiting for the right conditions to bloom. Green algae lives in the pond in free-floating form (hence the name: green water) and as mats or strings attached to surface areas. The latter form is desirable (within reasonable limits) because it is a valuable source of food for pond fish and it does aid in water filtration. (Ponds with very strong sun exposure also develop carpets of blue-green algae (Cyanophyceae) on stones, plants, and pond walls. This is also a good source of fish food.)

Since algae is a plant, there are three basic requirements necessary for its growth: sunlight, nutrients, and carbon dioxide. Correspondingly, there are a number of variables in pond maintenance directly related to these requirements and, hence, are relevant to the control of algae:

(1) sun exposure
(2) pond design
(3) fish population
(4) fish feeding
(5) soils in and around the pond
(6) water inflow and outflow.
(7) plants in the pond
(8) filtration system

Sun Exposure

As noted algae is a plant. Consequently, the more sun the pond receives, the greater the rate of algal growth. Ponds that are perpetually in the shade have easily managed algae problems. Ponds that receive many hours of sun each day become pea-soup green and require significant efforts to keep clear; but it is not impossible.

Early morning and late evening sunlight pose little problem, since light intensity is crucial to photosynthesis. It is the intense sun from about 10am to 4 pm that contributes to excess algae growth.

Awnings -- either natural (trees) or man-made -- that block out direct sunlight can make a significant difference in algae growth. Yes, the pond will still turn lime green initially each spring, but it can be cleared rapidly and maintained that way with almost no effort.

Water lilies that cover at least 60% to 75% of the pond surface will also act to cut sunlight reaching the algae. Unfortunately, goldfish and koi like to hide underneath lily pads and so the fish will often be obscured. Nevertheless, this is still preferable to having your pond look like a sunken pool table.

Pond Design

At any given latitude and time of the year, the amount of solar radiation available for use by algae for photosynthesis depends on the surface area of the pond. The larger the pond's surface area, the more sunlight it collects. Consequently, a wide but shallow pond will soak up far more heat and light than a smaller but deeper pond of the same gallonage. In other words: The critical variable is the quantity of gallons below each unit surface area of the pond (continued on page 5)
The Hydrocotyle Conspiracy

By Matt Nelson

Attention all water gardeners: You are the Earth’s last defense against hostile alien invasion. Right now, unknowingly, you are growing the only known weapons we have that keep alien invaders at bay. These weapons are commonly referred to as tropical and winter hardy marginal plants. You are also harboring an extraterrestrial implement of war, which is capable of destroying the Earth’s only weapons. Hostile alien researchers have developed a weapon that has infiltrated our water gardens and will take over and kill all of the populations of marginal plants. This alien assault weapon is commonly referred to as water pennywort. Earth’s marginal plants happen to be the final barrier the aliens face before they can conquer Earth.

Marginal plants are highly toxic to the alien invaders. They are their only weakness and Earth’s only weapons. On Earth, unsuspecting water gardeners complacently grow this extraterrestrial assassin not knowing the grave repercussions of their actions. Our research shows that the sun is the cleverly disguised transmission relay device. Further research indicates the leaves of the pennywort follow the sun across the sky, we believe, to continually relay their progress to the alien invaders. Also, ingrained into the pennywort’s DNA by the alien invaders is a mind control gas. Once emitted, the mind control gas persuades us into being attracted to pennywort, and therefore, makes us want to introduce it into our homes.

The problem with writing this article, I fear, is that if I inform the masses about this epidemic, I will cause widespread panic. People will try to eradicate pennywort by any means possible. In the process people will inadvertently kill the Earth’s marginal plant populations. Essentially accomplishing what the alien invaders have attempted to do with their weapon (pennywort). No matter if I keep quiet or inform the masses the Earth is doomed. ☹

Snowdrops: Thanks Gabriella Bertelmann

From the cold crystal beauty of ice-flowers and beads, muffled sounds in snow-packed streets
too many layers of clothes, to stay warm,
to the first subtle glory of spring coming on.

I found the first snowdrop, so tender and white,
heard the twitter of birds in pastel morning light.

I’m out looking for treasures pushing up
through the ground—quietly, bright green and crisp,
shivering under warm breeze’s kiss.

Pink and white blossoms alive as the sea
will cover this earth soon, intoxicate me
with celestial perfume.

Oh, how wonderful to be alive!

The Water Garden

Echter’s Garden Expo:
Don’t forget Echter’s Garden Expo Friday March 2nd from 2:00PM til 5:30PM,
Saturday 3rd from 10:00AM til 5:30, &
Sunday 4th from 10:00AM til 4:30PM.

Financial News:
As of the first of the new year:
Starting Balance:
$16,706.73
Control of Green Algae in Ornamental Ponds  

(continued from page 3)

pond. The larger the ratio of gallons per square foot of surface area, the smaller the amount of solar radiation per gallon.

Fish Population and Fish Feeding

Algae also require nutrients, and here the waste of pond fish is made to order. It is rich in nitrogen -- the perfect plant food. Obviously the quantity of waste produced is proportional to the number of fish, the size of fish, and the feeding rate. [Regardless of whether the fish eat the food or not, it still will break down into nitrogen.]

Koi -- being bottom feeders -- exacerbate the problem by constantly stirring up the bottom. The resulting turbulence recirculates deposited organic materials to the surface waters. Thus, nutrients that were originally "out of reach" of the algae growing nearer the surface eventually become available.

A big pond with few fish that are fed sparingly will not support as much algae as the same pond that is heavily stocked with well fed (or, overfed) fish. I can offer a rule of thumb here, though it is linked to pond oxygen capacity and only indirectly to waste production. There is good evidence that the following applies to ponds that are not artificially aerated (i.e., all gas exchange occurs by pond surface contact with the air):

<table>
<thead>
<tr>
<th>Fish Size (inches)</th>
<th>Minimum Pond Surface Area per fish (square feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1.5</td>
</tr>
<tr>
<td>6</td>
<td>4.8</td>
</tr>
<tr>
<td>12</td>
<td>16.3</td>
</tr>
<tr>
<td>18</td>
<td>33.0</td>
</tr>
<tr>
<td>24</td>
<td>54.6</td>
</tr>
</tbody>
</table>

Given the design rules noted earlier, this means that a 1500 gallon pond with 100 ft² of surface area could hold about six 12 inch koi. It is true that with the addition of substantial artificial aeration and

Theoretically feeding rates should be determined by filter capacity. In reality, it is sufficient to use the old rule of thumb: Feed according to what the fish will consume in several five minute meals spread throughout the day. Stop feeding as soon as the fish begin to ignore the food. [Koi and goldfish do not have stomachs and so are unable to store foods for digestion.] Do not allow any food to accumulate in the pond.

Soils and Water

Soils used in the pond to support plants, such as water lilies, also supply nutrients for algae. [Of course, the same holds true for fertilizers added to pond plant containers.] It is desirable, therefore, to top-off in-pond plant containers with an inch of heavy gravel to prevent large-scale nutrient leakage. Here again koi make things worse by rooting in the plant pots and dislodging soil into the water. [The addition of large flat stones to the top of the pebble course will prevent this noxious behavior.]

Fresh water added to the pond also contains nutrients. That is why IT IS A MISTAKE TO CHANGE THE POND WATER IN THE HOPE OF CLEARING THE ALGAE. It is only a temporary fix that will ultimately boomerang and make things worse. As is described below, the whole idea behind algae control is to remove nutrients. New water adds nutrients. [This does not apply to those situations where water turnover is continuous, that is, where water is continuously flowing in and out of the pond. This is typically at a rate of a gallon per minute or more. Such ponds will always stay clear. Few of us, however, can afford this luxury.] If proper controls are maintained, regular water changes of 15 per month -- necessary for good fish health -- can be carried out without problems.

It is equally important to make sure that no ground surface run-off -- due to rains or lawn watering -- flows into the pond. Not only will this bring new water to the pond, but nutrient-rich soil will be deposited in the pond as well.

The droppings of water fowl will produce similar results. Let your ducks swim somewhere else!

Plants in the Pond

Plants in the pond, such as water lilies, water hyacinth, and elodea, compete directly with the algae for nutrients. Water hyacinth are particularly good in this regard because they are not planted (hence no soil in the pond). Iris and other water plants can be planted in gravel beds (and even in the filter bed).

[In this regard be careful not to put too many oxygenating plants in the pond. At night they convert to respiration and consume pond oxygen. Most pond plants are not oxygenators.]

Filtration System

Last, but not least, we need to consider the filtration system. A seasoned mechanical filter -- i.e., one that has been running for a month -- will remove considerable amounts of dead algae and other large organic materials from the water. Since algae depend on suspended organic materials and minerals, a good mechanical filter will limit the available nutrients for new algae growth. Efficient flow rates through mechanical filters are fairly high: 10 to 50 gallons per square foot of filter surface per minute. This is largely because mechanical filtration, unlike biological filtration, is a function of filter volume not surface area. The probability of particle capture depends on the number of potential surface collisions with the filter medium. Thus, a high flow rate increases the frequency with
Control of Green Algae in Ornamental Ponds

(continued from page 5)

which a given particle will pass through the filter, and hence increases the probability of capture. Typical pond water turn over rates may be one to four complete passes per hour.

Even better results can be obtained if a sump or settling basin can be incorporated into the pond design directly before the filter. This sump/basin will collect heavy wastes and dead algae that can then be drained off regularly. Again, this reduces the suspended nutrient content of the water. Field tests have shown that the simple addition of a pre-filter settling basin can cut algal growth by 75 or more.

Biological filtration -- the conversion of ammonia to nitrates, and nitrates to nitrites -- combined with strong artificial aeration also cuts algae growth significantly. Algal photosynthesis requires carbon dioxide, but nitrifying bacteria also use carbon dioxide for cell construction. A healthy biological filter is in constant dynamic equilibrium as old bacteria die and new bacteria form. Thus, nitrifying bacteria compete with algae for dissolved carbon dioxide.

There are many ways to design a biological filter for the pond. A generic design is a gravel filter through which pond water is fed. The essential biological activity takes place in the first 8 to 10 inches of filter surface area (at the top in a down-flow design; at the bottom for an up-flow design). Thus, for biological filtration the gravel bed need be no deeper than one foot. [A deeper bed may be desireable for mechanical filtration]. Experimental evidence suggest that biological activity seems to peak with flow rates of about 1 gallon per square foot of filter surface per minute. For reasonable biological filtering, a turnover of pond water should occur about once every one to two hours. Therefore, our 1500 gallon pond might require a biological filter between 12 and 25 square feet in surface area and 12 inches deep.

One can sub-optimize by combining mechanical and biological filters into a single system. This might be a filter with a flow rate of 2 gallons per square foot of filter surface per minute with a depth of 12 to 18 inches. Pond water turnover might be one complete volume pass per hour.

The growth rate of nitrifying bacteria in the filter is affected by water oxygen content: the more oxygen available, the larger the colony. Hence, strong aeration can make a given bacteria colony more “competitive”. Aeration can be provided by waterfalls, artificial streams, mechanical jet aerators, fountain sprays, and turbulence towers.

Summing Up

Algal bloom will occur once or twice every year regardless of efforts to prevent it. However, after a few weeks in a properly managed pond the algae population will literally collapse overnight. The next morning the pond will be perfectly clear. When this occurs, it is advisable to vacuum/filter out as much of the dead algae lying on the pond bottom as possible, for large deposits of dead algae will depress oxygen levels in the pond.

Algal population collapse can be artificially induced with commercial algicides. These are temporary fixes at best, and dangerous at worst. If the pond conditions are not properly controlled, the algae will bloom again within a week. More importantly, most algicides are toxic to koi and/or pond plants. Even if the first dose has no noticeable effect on the fish, repeat doses will kill them.

One product, ACUREL-E (R), is not a true algicide, but a chemical that “captures” suspended organic and inorganic particulates and deposits them on the pond bottom. It literally starves the algae and a population collapse occurs within 24 hours. [As noted in the case of a natural algae population collapse, it is important to vacuum/filter out the heavy particulates and dead algae in order to prevent oxygen depletion.] The chemical itself does not harm fish or plants. This too, however, is but a temporary fix. Unless nutrient levels in the pond are controlled algae will bloom within a week. Of course one can apply ACUREL-E each week, but the chemical is quite expensive.

By far the most efficient and effective approach to controlling green water is via the manipulation of the elements discussed above. These rules of thumb, of course, are not etched in concrete. There are many relevant tradeoffs. For example, a pond that is always well shaded will not require as much filtration/aeration as one exposed to sun for 10 hours a day. An overstocked pond in partial sunlight may have more severe algae problems than one that is under-stocked in full sunlight. The point is that you can manipulate these elements for controlling algae as it suits your situation.

A Freebee!

If you show up a bit early to our March 11 meeting you may want to visit the Denver Orchid Society Show and Sale. They will be in Mitchell Hall and if you have any questions on growing orchids this would be a good place to get answers. The show starts on Saturday from 10:00AM to 5:00PM and Sunday from 9:00AM to 5:00PM. Hope to see you at the meeting.