help give uniform feeding with some fluffy seeds. The seed boxes should have dividers so that on a slope all of the seed doesn't slide to one end of the box.

Most dryland seeding is performed with a mixture of different sized seed, and an agitator is required to keep the seed from segregating in the box. Many extremely small seeds, like sand dropseed, should be planted separately through a small seed box or it will shake out of slick seed mixes like wheatgrasses, unless there is a lot of fluffy seed in the mix such as blue grama. I will always advocate the value of experience on the job site because seed of the same species will vary in trash content from lot to lot. Blue grama is a prime example because only a limited acreage has been alloted to seed production and the rest has to be collected from native stands. To separate it down to 99% clean destroys more seed than you save in *looks* by having "*clean*" seed. The germination is still there when it is tested for pure live seed even if trashy material remains attached.

If slope is less than 3:1, seed drills will provide good seed/soil contact without high seed rates or water at the site.

The drop tubes which connect the seed boxes to the planting bottoms need to be very flexible to bend and withstand the impacts when going over rocks and rough ground. The diameter should also be large enough to let the sticks and stems go through. The planting bottoms also need broad enough openings to allow the stems and fluff to pass. There are modifications that help the standard bottom. Most bottoms are steel castings and will break after traversing miles of rocks and rough ground. These castings are not always easy to find when you are miles from a farming area. One fabricator (Tye, Inc.) produces a welded steel bottom that will take more abuse and can be repaired with a welder. The planting bottoms have depth bands on the disc that control the depth of seed placement. These are also easy to destroy in rocky ground and some are stronger than others. Packer wheels can be used in sandy soils to assist in depth control, but rocks will destroy them in a short time. Individuals that specify their use should check the site conditions first.

The limitations of where you can operate a drill are very basic. If it is too rocky for the disc to place the seed into the soil, then call in the broadcasters. If it is too steep to operate equipment safely (then someone should have designed the slope flatter, which is a subject in itself), then your options are more costly, labor intensive, and the resulting vegetative cover is less effective due to the repose of the slope.

Basically, if you can traverse the slope with a tractor, either wheel or crawler type, you can drill it — *safety is prime*. Wheel tractors with dual wheel arrangements can work a 3 to 1 slope in most instances. You can go beyond this with 4-wheel drive, a good experienced operator and a texture of soil that is stable enough to support the weight. Sand, gravel, round rocks, or mud will put you at the bottom of the hill in a hurry. Crawler type equipment will handle 3 to 1 and even steeper slopes depending on the soil texture. A low profile, wide tracked John Deere 350 is our main tool for drilling steep slopes; then safety becomes our limit. Specification writers should know safety limits and not try to exceed them. I have seen many specifications calling for drill seeding on 2 to 1 slopes — that is not a responsible recommendation and personal injuries are not a good tradeoff for lack of experience.

When you start thinking that a tractor can be held onto a slope by cables from above; then "call in the hydroseeders" and utilize a slope chain to bury the seed: it is less costly than an injury. There are some very complicated machines being tested by the Inter Agency Equipment Development Center at San Dimas, California, that are held onto slopes with a grade-all. These are a good alternative to hydroseeding and slope chaining, but are limited in reach.

Another excellent practice with a drill seeder that will see expanded use is *interseeding*. Again, this is an old range improvement practice and the term refers to planting more seed in poorly established stands of grasses. *Minimum tillage* is another term for planting in standing vegetation. A good example is in mine reclamation where the first treatment did not produce the required density of plant establishment or the diversity of plant species is lacking. By utilizing the litter remaining from weedy annuals and the protective cover of the desirable species, new seed can very effectively be planted with minimum tillage. A specially designed minimum tillage drill is equipped with rippers or discs that only disturb the soil in a narrow band in front of the planting disc. This treatment is very effective when growing your own mulch cover by planting annuals prior to planting the perennial species. This is a very effective way of increasing soilbiomass and microbial levels in subsoils of low productivity. It is an attractive alternative when mulch prices rise due to trucking costs or excessive competition with the livestock industry during drought years. **WTT**

WEED CONTROL FOR WORKING PONDS: GUARDING FUNCTION AND APPEARANCE

By **Jim Schmidt,** Technical Director, Applied Biochemists, Inc., Mequon, Wisconsin. He is author of the book "How to Identify and Control Water Weeds and Algae."

Ponds play an important role in the functioning of many modern facilities. They serve a variety of uses including cooling of industrial machinery, reservoirs for fire protection, treatment of wastes, and/or retention of storm water.

Consequently, the management of these ponds can be an important consideration in maintaining production, protecting costly equipment, lowering fire insurance rates, complying with effluent standards, or preventing floods. Frequently these ponds serve multiple purposes and must be managed accordingly.

Since many of these water bodies are located adjacent to the plant, their appearance can reflect the environmental consciousness of the company. Visiting customers and the surrounding community often obtain their first impression of an industrial facility based upon its external appearance.

Plant managers or industrial engineers are often the ones responsible for the upkeep and maintenance of these ponds. Unfortunately, many of the problems which confront them are of a biological nature, an area outside their training and expertise. While familiar with the mechanics such as flow rates, pump capacities, retention times, etc., when faced with nuisance aquatic weed and algae growth they are at a loss for solutions.

The very nature and uses of many industrial waters increase their potential for having nuisance vegetation problems. Cooling ponds often maintain relatively high water temperatures (60°F-90°F) year round. Aquatic plants, like terrestrial vegetation, respond to these warmer temperatures by growing faster and more persistently throughout the year.

Storm water retention ponds fed by runoff, sewage treatment lagoons, and ponds located in fertilized, landscaped areas receive high levels of nutrients (nitrogen and phosphorus) which enhance aquatic growth. Both warm water and high nutrient concentrations contribute to aquatic vegetation problems.

Mechanical rather than chemical solutions are often sought since most engineers are more

Practical functions of ponds include irrigation and drainage retention as in the case of this pond. These functions require extra management attention.

Herbicides for Pond Weed Management

Trade Name	Target Weeds	Precautions	Manufacturer
Algimycin (chelated copper)	Algae	Use when water is above 60 degrees F.	Great Lakes Biochemical
Amitrole	Waterhyacinth, cattails	Not for irrigation or drinking water.	Union Carbide
Aqua-Kleen (2,4-D)	Bladderwort, coontail, waterchestnut, watermilfoil, waterstargrass, waterlilly.	Not for irrigation or drinking water.	Union Carbide
Aquashade	Algae, submersed weeds, brittle naiad, pondweed.	Apply late winter, early spring.	Aquashade
Aquathol	Bassweed, coontail, watermilfoil, naiad, pondweed.	Not for irrigation within 7 days.	Pennwalt
Aquazine	Algae and many weeds.	See label.	Ciba Geigy
Banvel-720	Waterhyacinth, alligatorweed, arrowhead, water pennywort, smartweed, cattail.	Some state labels, only.	Velsicol Chemical Corp.
Casoron G-10	Elodea, naiad, watermilfoil, coontail, pondweeds.	Not for irrigation or drinking water. Preemergence.	Thompson-Hayward
Cutrine-Plus	Algae, Chara.	With granular treat pond in portions.	Applied Biochemists
Diquat	Bladderwort, coontail, elodea, naiad, pondweeds, watermilfoil, pennywort, duckweed.	Ten day wait needed before pond can be used for swimming, irrigation, drinking.	Ortho Div., Chevron
Hydrothol	Algae, Chara.	Fourteen day wait for irrigation or domestic uses. Treat only portions of pond at one time.	Pennwalt
K-Lox	Hydrilla, algae.	Apply on sunny day for actively growing hydrilla.	Sandoz
Vegatrol LV 4-D	Watermilfoil, water lilies, coontail.	Not for irrigation ponds.	Velsicol Chemical Corp.
Weedtrine II	Selected submerged and emergent plants.	Not for irrigation ponds.	Applied Biochemists

Applied Biochemists, 5300 W. County Line Rd., Mequon, WI 53092. 1-800-558-5106.
Aquashade Inc., PO Box 198, Eldred, NY 12732. 914-557-8077.
Ciba Geigy Corp., PO Box 11422, Greensboro, NC 27409. 919-292-7100.
Great Lakes Biochemical, 6120 W. Douglas Ave., Milwaukee, WI 53218. 414-464-1200.
Ortho Div., Chevron, 575 Market St., San Francisco, CA 94105. 415-894-3760.
Pennwalt Corp., 1630 E. Shaw, Fresno, CA 93710. 209-226-8400.
Sandoz Inc., 480 Camino Del Rio, San Diego, CA 92108.
Thompson-Hayward, 5200 Speaker Rd., Kansas City, KS 66110.
Union Carbide, 7825 Bay Meadows Way, Jacksonville, FL 32216.
Velsicol Chemical Corp., 341 E. Ohio St., Chicago, IL 60611.

familiar with equipment. Screens, filters or aerators are installed in an attempt to solve problems. When chemicals are used, they are frequently of the wrong type. Biocides containing quaternary ammonium chloride compounds, chlorine, and copper sulfate are initially introduced due to their availability and the engineer's familiarity with them. Understandably, results are often poor. These chemicals are not specifically designed to control the plants present and they might not be compatible with the water quality in the pond.

It is important to note that there are specific aquatic herbicides and algaecides which are registered with the Federal Environmental Protection Agency for use in ponds.

The combination of algaecides and herbicides applied as a tank mix have shown promise through enhanced effectiveness. Specific recommendations on tank mix uses are available from manufacturers.

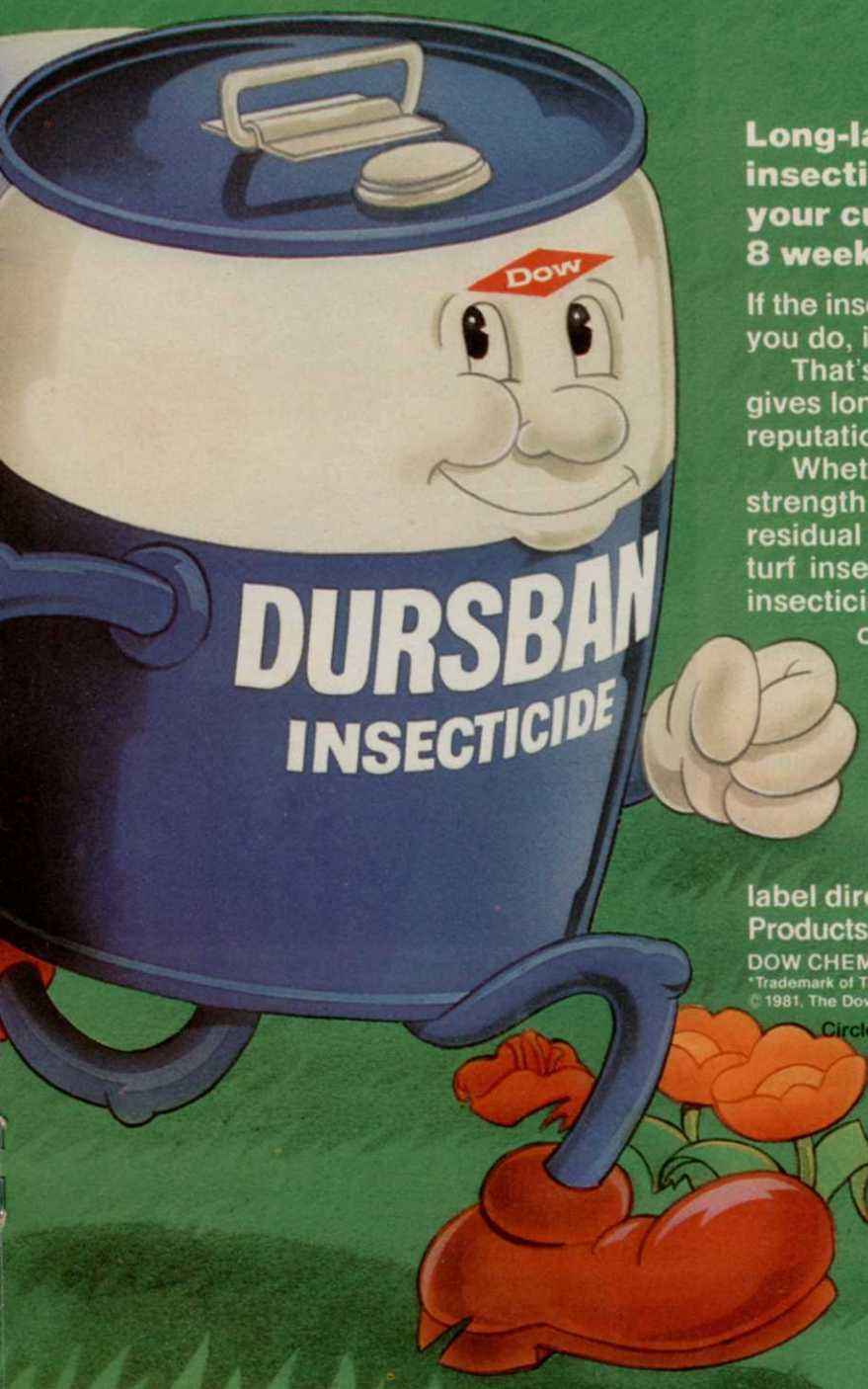
Several considerations must go into planning and implementing an aquatic nuisance control program. Before purchasing and applying anything, it is first necessary to identify the problem plants. State natural resource agents, university biologists, or Soil Conservation Service agents can usually be called upon for this.

Water volume or surface area and depth must be determined to calculate the amount of material required. Generally, aquatic chemical application rates are given in terms of gallons or pounds per surface acre (43,560 square feet) or acre-foot (326,000 gallons). Sometimes, parts per million (ppm) recommendations are given. One ppm is equivalent to 2.73 pounds of material in one acre-foot of water.

Flow, evaporation, or dilution with make-up water can affect results if they are not compensated for in the application. It is necessary that sufficient contact time between toxic concentrations of the herbicide and target plants be maintained for several hours. Granular formulations

Continues on page 58

DURSBAN KEEPS RUNNING STRONG. HELPS KEEP BUGS FROM COMING BACK BEFORE YOU DO.



Long-lasting DURSBAN* brand insecticide is good insurance for your customer list. It can last up to 8 weeks—not just 3 or 4.

If the insects get back to your customer before you do, it's goodbye good customer.

That's why you'll want the insecticide that gives long-lasting protection to your business reputation! DURSBAN brand insecticide.

Whether you use the 2E or the double-strength 4E concentrations, you get longer residual control than with any other leading turf insecticide. And best of all, DURSBAN insecticides even cost less to use than many others.

So for sod webworms, chinch bugs, billbugs, ants, grubs—you name it—why not use the insecticides that keep running strong. And long. Get DURSBAN brand insecticides.

Just be sure to read and follow all label directions and precautions. Agricultural Products Department, Midland, Michigan 48640.

DOW CHEMICAL U.S.A.

Dow

Circle No. 115 on Reader Inquiry Card

POND BOTTOM LINER STRATEGY IS MORE THAN A COVERUP

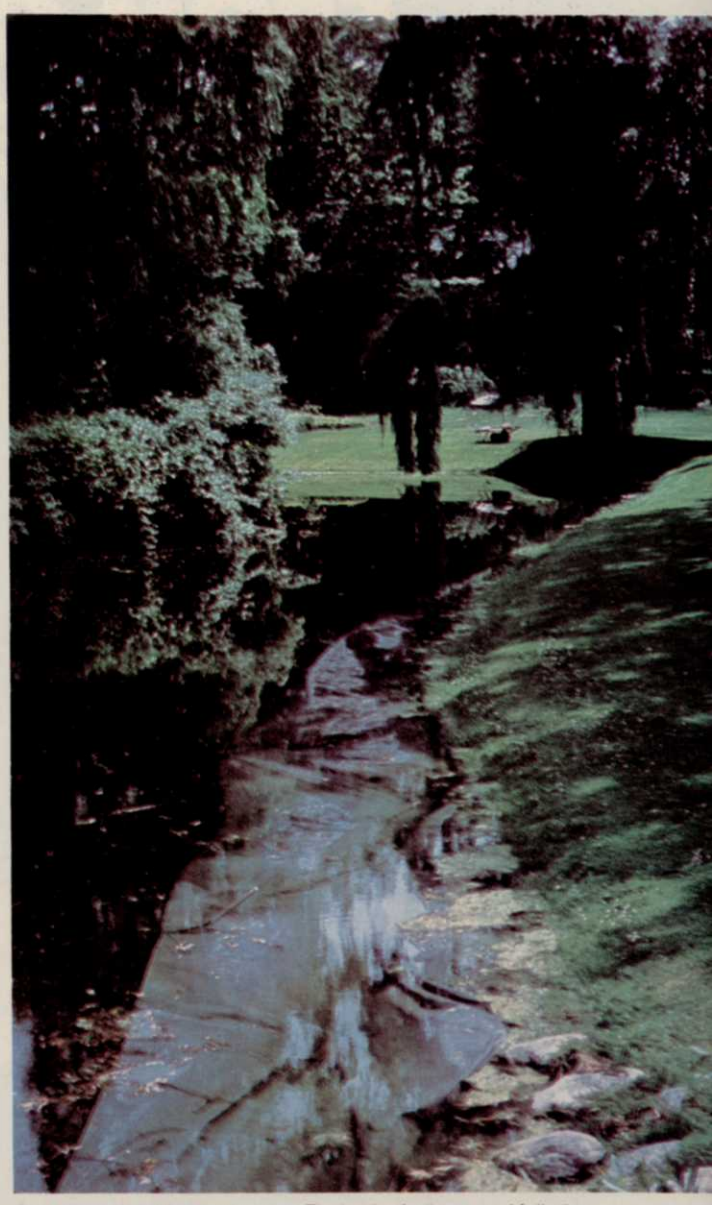
By **Douglas Pullman,** Aquatic Biologist, Dow Gardens, Midland, Michigan, and John Craig, Department of Fisheries and Wildlife, Michigan State University, East Lansing

Ornamental ponds are a common landscape feature of many midwestern arboretums, horticultural display gardens, golf courses, and housing subdivisions. These ponds are usually small, with areas less than 10 acres and depths rarely greater than 18 feet. The primary purpose of an ornamental pond is to enhance and highlight the beauty of the surrounding landscape. Occasionally, the ornamental pond is by itself an outstanding landscape feature. Secondary uses include fishing, swimming, and irrigation water supply.

Ornamental ponds are not merely holes in the ground that fill with water. To be an asset to a landscape, the ponds usually require intensive management efforts. Infestations of rooted and floating aquatic plants and blooms of various forms of algae have rendered many an ornamental pond a liability rather than an asset. The causes of excessive aquatic plant growth are surprisingly few. Excessive inputs of plant nutrients, inappropriate fish stocking, and the introduction of exotic plant species are the underlying causes for the decline of most ornamental ponds. Some aquatic systems management strategies deal directly with the underlying problems in ornamental ponds, but most are symptomatic cures. Management techniques used in ornamental pond management include watershed manipulations designed to limit nutrient inputs and sediment loading, deep dredging, piscicide applications, quarantining, harvesting, chemical herbicide applications, water dyes, bottom liners, flushing, water level control, raking, shallow dredging, drawdown, introduction and management of desirable plant and animal species.

Benthic semi-barriers are a recent addition to the arsenal of techniques used to control aquatic plant infestations. These barriers resemble large sheets of fiberglass windowscreen and are laid over the top of aquatic plant beds to control the plant growth beneath them. Perkins et. al. (1980) reported that a benthic semi-barrier, Aquascreen (manufactured by Menardi-Southern, Houston, Texas), was an effective control for Eurasian Watermilfoil *(Myriophyllum spicatum L.)* in Union Bay at the outlet of Lake Washington, Seattle, Washington. Mayer (1978) reported similar results for the control of various aquatic plant species in Lake Chautauqua, New York.

The pond located in the Dow Gardens, Midland, Michigan, is a 3.5-acre shallow water (mean depth less than four feet) ornamental pond. The primary function of the pond is one of aesthetics and secondary function is to supply irrigation water to the terrestrial gardens. Aquatic herbicides are rarely used in the pond because of its irrigation function. The pond system is infested with *Elodea canadensis* Michx. During the summer of 1979, Aquascreen was placed over a luxuriant bed of elodea. An attempt was made to fasten the screen to the pond bottom with stakes and brick weights, but these efforts were largely unsuccessful due to the



Aquascreen laid over vigorous Elodea in shallow pond failed to control by shading or compression. Elodea is moderately shade tolerant.

Continues on page 38

PEOPLE LOOK UP TO HI-RANGER.

"I ought to know. During my 14 years in utility maintenance, and even now as supervisor, I've worked hundreds of hours in the baskets of aerial manlifts. We've found Hi-Rangers provide consistently dependable performance, low maintenance, and long life. That's why now, all of our crews work in Hi-Rangers from Mobile Aerial Towers, Inc."

"Mobile Aerial Towers, Inc., is number one in their industry. That means something. Because we count on them to get us up to the job, day after day, and year after year."

Hi-Ranger aerial towers meet the "American National Standard for Vehicle-Mounted Elevating and Rotating Aerial Devices ANSI A92.2-1979."

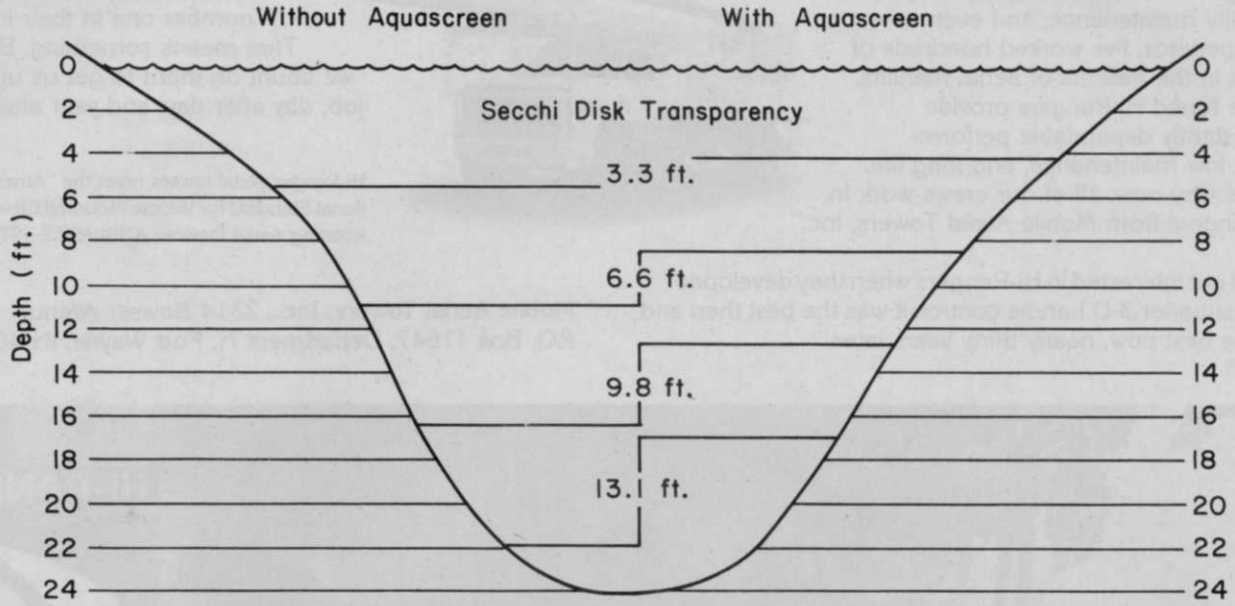
"I first got interested in Hi-Rangers when they developed their superior 3-D handle control. It was the best then and it's the best now, nearly thirty years later."

Mobile Aerial Towers, Inc., 2314 Bowser Avenue
P.O. Box 11647, Department N, Fort Wayne, IN 46859

Circle No. 129 on Reader Inquiry Card

Coverup *from page 36*

dense and rigid structure of the plant community. Despite this problem, the Aquascreen was left in place to see if plant control would come about by shading out the elodea beneath the screen. The elodea, growing beneath the Aquascreen, did not decline in vigor, however. Complaints concerning the appearance of the test site led to the removal of the Aquascreen



Comparison of the maximum depths that *Elodea canadensis* can grow without being limited by too little light under natural conditions and under Aquascreen given four different Secchi disc transparancies.

four weeks after it was applied. It appeared that the light attenuation was not great enough to control aquatic plant growth in shallow water.

Light Limitation

An investigation of the percent light attenuation caused by Aquascreen was conducted with a Li-Cor LI-188 Quantum/Radiometer/Photometer. Measurements were made in air and at various water depths. Our findings agreed with other researchers (Perkins et. al., 1979; Mayer, 1978) that Aquascreen attenuated light penetration by roughly 60%.

The depth to which light can penetrate through a column of water is a function of scattering and absorption by the water and dissolved and suspended substances in the water. A standard measure of transparency (depth of light penetration) in a pond or lake is made with a 7.9-inch (20 cm.) diameter white disc called a Secchi disc. These discs can be purchased from many scientific supply companies or can be easily constructed from a variety of common materials. A Secchi disc is lowered into the water on a line, cord, or chain to the depth where it just disappears as viewed from the water surface and then raised again to the depth where it reappears. The mean of these two depths is the Secchi disc transparency value for that pond or lake. The greater the depth where the disc finally disappears, the more transparent the water.

The maximum depth at which rooted, submersed plants can grow in typical ornamental ponds is determined by many factors but chief among these is water transparency. Secchi disc transparency roughly estimates a depth that is a certain fraction of the depth where light is so attenuated by absorption and scattering that it is not adequate to allow plant growth. This maximum depth varies from species to species, ranging from where 2% to 10% of the light that falls on the surface still remains. Like terrestrial plants, some aquatic plants are more shade tolerant than others. Elodea is a relatively shade tolerant species. Data suggest that it can grow where only 4.5% of surface light still remains (Hutchinson, 1975). Figure 1. shows graphically the maximum depth that elodea can grow, given different water transparencies with and without Aquascreen. Above the data lines light is sufficient for elodea to grow, but it would not grow at greater depths due to light limitation. It is obvious from this figure that Aquascreen does not shade

Continues on page 51

REVIEW OLD BUSINESS IDEAS FOR USE IN TODAY'S MARKET

By Dave Johnstone, business columnist

It's hard to believe that only 22 or 23 years ago, the American Seed Trade Association's National Garden Bureau launched a community beautification campaign at North Tonawanda, New York, spearheaded by the local newspaper and involving local garden clubs, schools, school children, and just about every community element. At about the same time, Pontiac State Hospital in Michigan began to construct gardening programs for inmates which it termed "Horticultural Therapy" and city blocks in Philadelphia's blighted neighborhoods began to install window boxes. Most of these very promising efforts have run down, although an occasional garden club still dresses up a railroad station with petunias once a year, and various agencies of the federal government are plugging vegetable gardens as an inflation/poverty fighter in their news releases.

Polish Up Old Ideas For Local Application

Some of those concepts are still viable. Community relations aside, if you get the contract for cleaning up a creek and installing walkways or preparing vegetable garden beds, it's plus business. One general disadvantage to this type of thing: you usually have to take the time, effort and budget to sparkplug the program and see it through, as well as to provide for volunteer group labor, which is sometimes difficult to manage, and sometimes easy.

Be careful not to foreclose a new idea or approach before it's been tested. Example: There is a section of town adjoining a park and comprised of old mansions — not huge buildings but substantial homes. These homes are now all cut up, but because there has been a tradition of using outside grounds maintenance service in the neighborhood, this service has been continued. Two blocks away, the same conditions exist, except there has been no tradition of using outside grounds maintenance; yet, the homes are all cut up. There is now a strong reason to go that route; and even where the entire yard must be devoted to resident parking, there are possibilities for blacktopping, graveling, and even barrier planting of young trees to define property lines and improve appearance. These potentials are highly visible, but not to someone who says to himself, "There's never been any business in this neighborhood."

Rehabilitation is Probably Best Bet

Contrary to reports, new building and land development has not completely halted, although it is not especially brisk. In this economic climate, rehabilitation probably provides the best potential. Keep your eye open for properties, projects, and neighborhoods where rehabilitation and remodeling is contemplated. Conversion of old railroad stations, fire houses, school buildings, and warehouses into shopping strips, residences, and restaurants is still proceeding, and every such conversion should have a Green potential of some kind.

Dave Johnstone has more than 15 years experience in the construction equipment market. He has managed product introduction to the construction and rental equipment markets and has worked for a rental industry association. He has hands-on experience with nearly all types of outdoor equipment. If you have topics you would like Dave to address, you may write him at 267 Willow St., New Haven, CT 06511.

Rehabilitation of properties can make up for a slowdown in new building starts.

Where do you get your leads on these developments? From construction publications, of course (remember, you're as much a builder as any bricks-and-mortar trade), and bid advertising in the legal want-ads, but primarily from community involvement. Often, by the time projects are announced and bids are let, the details have been cast in concrete. Since they're called in at an early stage, architects are productive contacts. See if you can't become an associate member of your local or state contractors' organization as well as of the American Institute of Architects chapter.

There are two essentials you may find difficult to grasp: 1) as a going business, your operation has more elements in common with the building field than with arboriculture, horticulture, or agronomy from the standpoint of finances and market segments; and 2) the labor, equipment, materials you apply to a given task have their only economic importance as contributors to your operation's profit margin (we're not talking about subjective values, only about money values).

You have to evaluate prospective business (especially business with which you may be somewhat unfamiliar) from the bottom line. Community organization projects are great, but will the expense of supervising unsteady volunteer labor

Continues on page 42