# Vegetable Crops Hotline

A newsletter for commercial vegetable growers prepared by the Purdue University Cooperative Extension Service

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**TIPS FOR SUBMITTING GREENHOUSE SAMPLES** – (*Gail Ruhl, Sr. Plant Disease Diagnostician Purdue University Plant & Pest Diagnostic Laboratory*) - Samples in plug trays, as well as unrooted and rooted cuttings, and plants in pots require extra care when they are packaged for submittal to a diagnostic lab. Before you mail the next sample, please take a few minutes to review these suggestions for packaging and submitting samples. This will help preserve the integrity of the sample during shipment and increasing the likelihood of a more accurate diagnosis.

**Plugs - keep them in the tray -** If possible, do not remove the plugs from the plug tray. Submitting either an entire tray or cutting off a section of the tray helps maintains the integrity of the plants (Figure 1). Secondary decay often occurs when soil is allowed to come



in contact with the foliage, interfering with accurate diagnosis. When possible, submit at least 5-10 cells with plugs. This provides the diagnostician with ample material for microscopic observation, culturing, and virus testing if necessary.

**Cuttings - separate foliage from media with a plastic bag -** The primary concern is to keep the growing media separate from the foliage to prevent contamination and rotting. Put the cuttings into a plastic bag, and seal the bag with a twist tie at the soil line (Figure 2). Do **not** seal the foliage in a plastic bag (Figure 3). Next, wrap the sample in newspaper to prevent additional drying out of foliage before it is received. Newspaper is one of the best packing materials for plant samples.



Figure 2

PPDL/Purdue Univ.



**Potted Material - pack around the plant** - Take into consideration that the mail carrier will not necessarily keep these packages right side up. Place plastic wrap, clear packing tape or paper over the pot surface, or put the pot in a bag and seal it with a twist tie around the base of the plant (Figure 4). Fill any extra space in the shipping box with newspaper, styrofoam peanuts, or another space filling packing material to prevent jostling of sample during shipment (Figure 5).



If you are delivering the sample to our building... We welcome delivery of samples in person! There are two short-term metered parking spaces on both sides of our building. Samples may be dropped off from 8am-5pm in room LSPS 101 in the two-story brick building (Life Sciences Plant and Soils) located in-between Lily Hall of Life Sciences and the Life Science Greenhouses. A completed submission form must accompany all samples. Sample submission forms can be downloaded from our website **<www.ppdl.purdue.edu>** and filled out ahead of time or are available at the drop off point.

**Shipping - avoid the weekend** - Do not mail or ship samples on Friday, as we are not here to receive them over the weekend. Samples can be sent via US mail, UPS, FedEx, etc. We encourage you to send samples with priority or express delivery so we receive them in the best condition possible to provide you with the most accurate diagnosis.

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WESTERN BEAN CUTWORM: A NEW PEST OF SWEET CORN - (*Rick Foster*) - The western bean cutworm has historically been a pest of dry beans and corn in Colorado, Nebraska and other western states. A few years back, for some unexplained reason, they began to move their range eastward. In 2006, the first year we put out pheromone traps to see if this pest had reached Indiana, we caught moths in the northwestern corner of the state. Since then, trap catches have increased and the range has spread. In 2009, we saw damage (Figure 1) in corn (field, seed, or sweet) in a number of counties in the northern third of Indiana (see Figure 2). A number of seed corn fields were treated for western bean cutworms.



**Figure 1:** Life stages and sweet corn damage due to the Western Bean Cutworm. A-adult moth. B-eggs. C-feed-ing damage may occur in the middle of the ear. D-close up of the larval stage feeding. (*Photos by John Obermeyer*)



**Figure 2:** Indiana counties shown here in red had 0-50% Western Bean Cutworm damage in 2009.

Western bean cutworm has a single generation per year. Moths become active in late June and continue to fly and lay eggs through July. Eggs are laid in masses. Larvae will enter the ear through the tip or through the side.

Although the chances of having an economic infestation of western bean cutworms in your sweet corn is much less than having a corn earworm infestation, growers in the northern third of the state should begin watching for damage in early July. If you see damage, you should probably treat with one of the pyrethroid insecticides (Warrior<sup>®</sup>, Brigade<sup>®</sup>, or Mustang Max<sup>®</sup>) that you would use for earworm control. The biggest concern about western bean cutworm at this point is that it occurs during July, which is between generations of corn earworms. We usually don't have to worry about worms in the ears of our sweet corn during July, but that may be changing in some parts of the state.

PHEROMONES AND PHEROMONE TRAPS - (Rick Foster) -One way insects communicate with individuals of the same species is with pheromones. Pheromones are volatile chemicals released by an insect that usually can be detected only by individuals of the same species. There are a number of different types of pheromones, but the most common type is the sex pheromone. Usually the females will emit a tiny amount of a chemical that attracts the male to her and increases the likelihood of mating. Because the chemical is volatile, air currents carry it. The male detects the pheromone in the air with receptors on his antennae. He then flies upwind to find the source of the pheromone, a prospective mate. The chemical compositions of pheromones for a number of pest species have been identified and synthetic copies can be produced in the laboratory. Synthetic pheromones can be used in conjunction with traps to catch male insects.

There are a number of vegetable insect pests that can be monitored with pheromone traps. In my opinion, the most important pest to monitor for is corn earworm/ tomato fruitworm.

Listed below are some, but certainly not all, of the suppliers of pheromones and traps.

Gempler's; P. O. Box 270; 100 Countryside Dr.; Belleville, WI 53508; (800) 382-8473; <www.gemplers.com>.

Great Lakes IPM; 10220 Church Rd., NE; Vestaburg, MI 48891; (517) 268-5693; <www.greatlakesipm.com>.

Insects Limited Inc.; 16950 Westfield Park Rd.; Westfield IN 46074-9374; (317) 896-9300; <www.insectslimited.com>.

Pacific Biocontrol Corporation; 620 E. Bird Lane, Litchfield Park, AZ 85340; (623) 935-0512 or (800) 999-8805; <www.pacificbiocontrol.com>.

Scentry Biologicals Inc.; 610 Central Ave.: Billings MT 59102; (800) 735-5323; <www.scentry.com>.

785-1313; <www.trece.com>.

You can buy most pheromone traps from these suppliers, but for corn earworm/tomato fruitworm, I recommend that you use the wire mesh trap which is available from:

Bob Poppe's Service; 25738 N. 3200 Road; Lexington, IL 61753; (309) 723-3201.

The wire traps catch more moths and last longer than the nylon traps.

To get the most from your pheromone traps, they must be used properly:

- Place the traps and the pheromones out before you would normally expect the insect pest to be active. That way you can monitor the adult activity, which will warn you that damage from the larvae may be coming soon.
- Be careful how you store pheromones. Ideally, they should be frozen until ready for use. At the very least, they should be refrigerated. If you keep them on the dashboard of your truck, they won't work well when you place them in the trap.
- When handling pheromone lures, do not touch them with your hands. Use a pair of forceps or wear latex gloves. This is especially important when you are using pheromones for more than one pest. Contamination of a lure with another pheromone will likely reduce the effectiveness.
- Lures usually should be changed every 3-4 weeks, although this will vary for individual lures.
- Check traps regularly, at least weekly. Daily would be better.

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**SEED AND ROOT MAGGOTS** - (*Rick Foster*) - Three species of seed and root maggots attack vegetables in Indiana. The seedcorn maggot feeds on seeds and seedlings of sweet corn, cucurbits, lima and snap beans, peas, and other crops. Cabbage maggots can cause serious damage to transplants of cabbage, broccoli, cauliflower, and Brussels sprouts and make the fleshy roots of radishes, turnips, and rutabagas unmarketable. Onion maggots are pests of seedling onions, developing bulbs and onions intended for storage.

Seedcorn maggot flies emerge in April and May and lay eggs preferentially in areas with decaying organic matter. Fields that are heavily manured or planted to a cover crop are more likely to have seedcorn maggot injury. Maggots burrow into the seed and feed within, often destroying the germ. The seeds fail to germinate and plants do not emerge from the soil, leaving gaps in the stand. When infested seeds germinate, the seedlings are weak and may die. Maggots also will feed within the stems of transplants.

Any condition that delays germination may increase damage from this pest. Damage can be reduced by planting into a well-prepared seedbed, sufficiently late to get rapid germination. The slower the rate of growth, Trece Incorporated; P. O. Box 129. Adair, OK 74330; (866) the greater the likelihood of seedcorn maggot injury. For any type of early season transplant, soil temperatures should reach at least 70°F or more for 4-5 days in a row to avoid maggot injury. Anything that raises soil temperature (black or clear plastic mulch) will increase soil warming and decrease the possibility of seedcorn maggot injury. Once damage is observed, the only management strategy available is the decision to replant or not.

If you decide to replant, be sure to use treated seed. When resetting transplants be sure to wait 5 days from the first evidence of wilted plants before you reset.

In 2008, I had a seedcorn maggot trial on muskmelons at the Southwest Purdue Agricultural Center that had severe damage. The plot was planted the last week of April and within a week showed serious damage. The photographs below (Figures 1, 2, and 3) show the level of damage observed. The following graph shows the soil temperatures measured during the course of the study and the pictures show the level of damage observed. Notice that the soil temperatures never reached the 70°F during the study. This provided perfect conditions for seedcorn maggot injury. We tested several products that are labeled for use on muskmelons to control other pests, but none showed very good levels of control (Table 1, page 5).



Figure 1: Several muskmelon plants in this row have been severely damaged by seedcorn maggots. (*Photo by John Obermeyer*)



**Figure 2:** This muskmelon plant has died as a result of seedcorn maggot damage. (*Photo by John Obermeyer*)



**Figure 3:** Seedcorn maggots are about 1/4 of an inch long and cause damage by burrowing into plant tissue. (*Photo by John Obermeyer*)



Table 1: Percentage Dead Muskmelon Plants - Vin- cennes, IN 2008					
Treatment	Rate	% Dead Plants (5/16)			
Untreated		58 abc			
Admire®	16 fl. oz./A	77 a			
Admire®	24 fl. oz./A	63 abc			
Platinum®	5 fl. oz./A	71 ab			
Platinum®	8 fl. oz./A	42 bcd			

Cabbage maggot injury is also favored by cool, wet conditions. The flies, slightly smaller than a housefly, emerge in late April or early May and lay white eggs at the base of newly set plants. Larvae from this first generation tunnel in the roots of small plants, causing the plants to appear sickly, off color or stunted, and may cause them to die. Early cabbage and turnips are particularly vulnerable to damage. Control of first generation maggots can be achieved using soil insecticides such as Lorsban<sup>®</sup> or Diazinon<sup>®</sup> at planting or transplanting. For short season crops such as radishes and turnips, longresidual insecticides cannot be used. Cabbage maggots usually do not affect later planted crucifers.

Onion maggot flies emerge throughout May and lay eggs at the base of onion plants. The maggots attack the underground portions of the onion plants and cause plants to wilt and die. Seeded onions are more susceptible than transplanted onions. Do not overseed to compensate for losses to onion maggots. The flies do not space their eggs evenly, so you may end up with smaller bulbs because the plant spacing is too close. The second-generation flies emerge during July and the third generation emerges during late August and early September. Each generation will damage onions.

Removing cull onions after harvest and planting as far as possible from fields planted to onion the previous year can reduce damage. Soil drenches of Lorsban® or Diazinon® at planting will effectively control first generation maggots and provide some control of the second generation. As the onions begin to mature, they become physically resistant to attack from onion maggots, unless they have been injured in some way. Be careful during field operations not to damage the growing plants in any way. A nick in an onion bulb allows the maggots to enter and begin feeding. Also, the flies are attracted to damaged onions to lay eggs. Reducing the amount of physical damage to the onions at harvest as much as possible will also reduce the amount of injury from the third generation. Do not apply foliar sprays to kill flies before they lay eggs.

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MIDWEST VEGETABLE PRODUCTION GUIDE FOR COM-MERCIAL GROWERS 2010 - This extension publication (ID-56) is available in hard copy as well as on the Internet <www.btny.purdue.edu/Pubs/ID/ID-56/>. Below find an update of the new information that may be found in this guide for 2010.

#### New and Revised Sections

- Pesticides that are considered Reduced Risk by the U.S. Environmental Protection Agency (EPA) have been identified throughout the guide.
- Color photographs of pest and horticultural problems have been added.

#### Disease Management

- Disease/host combinations have been added to Table 22, Summary of Cultural Management Strategies of Disease.
- Revisions have been made to the fungicides recommended for late blight of tomato and potato. See the Fruiting Vegetables and Potato sections.
- Switch 62.5WB® has been labeled on several vegetable groups. See the Brassica and Leafy Greens, Cucurbit Vegetables, Fruiting Vegetables, Legumes, Leafy Vegetables, and Root Vegetables sections.
- Inspire<sup>®</sup> is labeled on fruiting vegetables.
- The Quintec<sup>®</sup> label has been expanded. See the Cucurbit section.
- Fungicide resistance information has been added. See the Cucurbit Vegetables section.

#### Weed Management

• Fusilade<sup>®</sup> (fluazifop) has been added for postemergence grass control in dry beans.

#### **Insect Management**

• Furadan<sup>®</sup> has been banned by the EPA for all agricultural uses in the United States. Growers cannot use Furadan<sup>®</sup> on any crops during the 2010 growing season.

**In addition**, the on-line version of the ID-56 is constantly updated. Below are the updates that have been added to date.

- The spelling of Shubin K. Saha's name was corrected.
- Difenoconazole was added to Table 23.
- The spelling of quinoxyfen and PHI information was corrected in Table 23.
- The entry for cantaloupe was changed to muskmelon in Table 23 to be consistent with how that crop is presented elsewhere throughout the guide. (Continued page 6)

- > Difenoconazole was added to Table 24.
- > Inspire<sup>®</sup> was added to Table 25 (note that Inspire is labeled only for fruiting vegetables).
- > The Gourmet green cabbage variety was removed from the Brassica section.
- A restriction for tomato only was added to Revus Top 2.08SC<sup>®</sup> for Anthracnose.
- Switch 62.5WB<sup>®</sup> was removed for powdery mildew (pepper and tomato only).

**SEED TREATMENTS FOR VEGETABLES -** (*Rick Foster and Dan Egel*) - Over the last 15 or so years, there has been increased use of seed treatments with systemic fungicides and insecticides. The insecticides are primarily neonicotinoids. See Table 1 that describes the different ways neonicotinoid insecticides are used on various crops. Neonicotinoids applied to the soil move from the roots to the shoots and will last for about 4 weeks. Similar insecticides applied to the foliage only move into the tissue sprayed and not to the roots. These only last about 7-10 days. Syngenta recently registered FarMore<sup>®</sup> seed treatments for use on a number of vegetables. This seed treatment contains three fungicides, Apron<sup>®</sup>, Maxim<sup>®</sup>, and Dynasty<sup>®</sup>, and one insecticide, thiamethoxam, the same active ingredient in Platinum<sup>®</sup> and Actara<sup>®</sup>. Trials on cucurbits conducted in Ohio by entomologist Dr. Celeste Welty showed that FarMore<sup>®</sup> provided control of striped cucumber beetles that was as good as using Admire<sup>®</sup> in furrow at planting without the inconvenience of making a planting time treatment and at lower cost. In seeded cucumbers, control was good during the cotyledon to 2-leaf stage but was not consistent beyond the 2-leaf stage.

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TABLE 1: NEONICOTINOIDS ON VEGETABLES						
Active Ingredient	Soil	Foliar	Seed Treatment			
imadocloprid	Admire®	Provado®	Gaucho <sup>®</sup> ; Concur <sup>®</sup>			
thiamethoxam	Platinum®	Actara®	Cruiser <sup>®</sup> ; FarMore <sup>®</sup>			
acetamiprid		Assail®				
thiacloprid		Calypso®				
clothianidin		Clutch®	Poncho®			
dinotefuran	Venom®	Venom®				

For many years, the only fungicides used on seeds were contact fungicides. Such fungicide applications were designed to control fungi that came into contact with the seed surface. Contact fungicides used on seed include the active ingredients thiram and captan. More recently, systemic fungicides have been used. These include the three fungicides listed above as part of the FarMore<sup>®</sup> program. Systemic fungicides are designed to not only control fungi in contact with the seed surface, but also to be taken up by the seedling. Water that comes in contact with the seed either through rain or irrigation will wash the fungicide off the seed into the surrounding soil. As the young roots grow, the plant will take up the fungicide. It is estimated that the benefits of such systemic fungicides will last about 4 weeks. Therefore, direct seeded vegetables will benefit more than transplants. For more information see Table 2.

Table 2: Fungicide Seed Treatments					
Trade name	Common name	Activity	Comments		
Captan®	captan	contact			
Thiram®	thiram	contact	Used to protect seeds from fungi on the seed coat.		
Apron®	mefenoxam	systemic	Same active ingredient as Ridomil <sup>®</sup> . Active against <i>Pythium</i> spp. and <i>Phytophthora</i> spp. diseases.		
Dynasty®	azoxystrobin	systemic	Same active ingredient as Quadris <sup>®</sup> . Broad spectrum activity.		
Maxim®	fludioxonil	systemic	No current foliar use. Broad spectrum activity.		

# **Indiana Vegetable Growers Association**

Membership Renewal/Application for 2010

#### **Benefits of IVGA Membership**

- Midwest Vegetable Production Guide for Commercial Growers, 2010 edition (ID-56) (available Jan. '10)
- Vegetable Crops Hotline subscription
- Listing in IVGA Directory of Wholesale Vegetable Producers (optional)
- Your web site linked on www.ivga.org
- Corporate members only: free ad on www.ivga.org
- Networking with other vegetable growers
- To renew or join, correct or fill out the form below and send in with your check payable to IVGA.

The information below will be printed in the membership directory that is sent to members only. It will also be used to mail you the Vegetable Crops Hotline, to fax or e-mail the Hotline Bulletin, and for IVGA correspondence. Please complete or correct if necessary. If you would like anything omitted from the directory, please indicate below. <i>Current membership expires 12/31 /10</i> First	The Indiana Vegetable Grower Wholesale Vegetable Produce included, please review your info necessary changes or additions. available to anyone who request Indicate quantity of each item: Si quantities; T=semi truckload qua O. Contact information for Wholesa elsewhere on this form: contacts phone1 fax	s' Association Directory of rs will be updated for 2009. To be ormation below and make any . The wholesale directory is ts it and will be posted on the web. =small quantities; X=wholesale antities. Indicate certified organic: 
e-mail	business/address	
website		
ID-56 Delivery: Please indicate whether you will pick up	e-mail	
your copy of the ID-56 at one of the following meetings: IHC	website	
(Indiana Hort Congress 1/19-21/10), IVGS (Illiana Veg	asparagus	onions_bulb
Growers' School 1/5/10), SW In. Melon Mtg. If you do not nick it up it will be mailed in March	blackberries_raspberries	onions_green
	broccoli	peppers_bell
	cabbage	peppers_hot
magazines that may be offered to IVGA members?	cantaloupe_muskmelon	potatoes
	cauliflower	pumpkin
Check here to OPT OUT of hard copy Vegetable Crops	chrysanthemums	radishes
Hotline. If you check yes announcements will be sent by e-	collards_mustard_turnipgreens	snap_bean
mail but no paper copy will be sent. <b>OPT OUT O</b> yes <b>O</b> no	corn_stalks	squash_summer
Membership Type	corn_ornamental	strawberries
Regular, \$35.00/year	cucumber	sweet_corn_bicolor
Industry/Corporate, \$75.00/year	eggplant	sweet_corn_yellow
Make Check Payable to: Indiana Vegetable Growers'	gourds_ornamental	sweet_corn_white
Return to:		
Indiana Vegetable Growers' Association	kale 1	turnips watermelon
c/o L. Maynard, Purdue North Central	pumpkin mini 2	davlilies 6
[1401 U.S. Highway 42]	spinach_3	apples 7
Office Lies Only	straw_4	peaches_8
Chack no Data Bac'd	lettuce_5	tomatillo_9
Check Date Rec'd. by		

**SEEDLING DAMPING OFF AND ROOT ROT** - (*Dan Egel*) - Cold winds howl across the landscape today, but it won't be long before growers will turn their attention to starting transplants in greenhouses. These transplants will be destined for vegetable fields when the weather improves. Unfortunately, some of those transplants will become diseased and die before making it to the field. Damping-off and root rot are two of the most common diseases of vegetable seedlings.

Damping-off may cause seeds or seedlings to rot prior to emergence through the soil (pre-emergence damping-off) or cause a brown area on the stem of the seedling where the stem (technically, the hypocotyl) contacts the soil. Affected stems may shrivel and become thin; ultimately the seedling will fall over, that is, damp-off.

Root rots may be suspected if seedling growth is slow and leaves and seed leaves (cotyledons) become yellow (chlorotic). While healthy seedlings have white roots that will completely fill the transplant cell, seedlings with root rot have discolored, rotted roots that do not fill the transplant cell.

Both damping-off and root rot are caused by a number of fungi which inhabit the soil (*Pythium* spp. and *Rhizoctonia solani* are two of the most common fungi involved). These fungi may infect seedlings alone or in combination with other fungi. The fungi responsible for these diseases may survive for long periods in soils, soil mixes or even on contaminated tools, benches or transplant trays.

Environmental conditions may also help to worsen damping-off and root rot. Cool, wet soils favor damping-off and root rot. Another factor that may aggravate damping-off is when seedlings become long and thin (etiolated). Seedlings raised in low light conditions tend to be long and thin because they are growing toward light. Such seedlings are often very susceptible to damping-off.

Below find some ideas for managing damping-off and root rot of seedlings:

- Avoid bags of soil or soilless mixes that have been broken open and store bags so that they do not come in contact with water or contaminated soil.
- Use only new or disinfected pots and trays to grow transplants. To disinfect used pots or trays, first clean these items so that they are free of soil and debris. Then use a 10% bleach solution or a quaternary ammonium solution as a disinfectant and then rinse with clean water. Always use gloves and goggles.
- Clean and disinfect all tools and bench tops that come into contact with soil to be used with transplants.
- Growers should avoid overwatering and should make an effort to keep soils warm. Avoid soils or

soilless mixes that drain poorly. Outside, fields with raised beds increase soil drainage and warmth.

- As much as possible, growers should use a light source that minimizes seedling stretch. Avoid greenhouses that restrict light either by shadows or due to the type of covering.
- Some seed treatments may help to manage dampingoff and root rot problems. See article in this issue.

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# LABEL CHANGE

**FURADAN®** - (*Rick Foster*) - As of January 1, 2010, Furadan<sup>®</sup> can no longer be used on cucurbits. This decision by EPA was contested by the manufacturer, FMC, as well as by Indiana growers. I even testified before EPA as to the benefits of Furadan<sup>®</sup> to Indiana melon growers. However, even though FMC continues to contest the ruling, EPA has rendered its decision and Furadan<sup>®</sup> cannot be used this year. In this case, you cannot use existing stocks that you may have purchased in the past. If you have existing stocks, you should contact FMC and they will purchase those back from you.

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## **ANNOUNCEMENTS**

Indiana Vegetable Growers' Association (IVGA) (\$35) members who haven't renewed for 2010 may use the form in this newsletter (page 7). Renewal includes a copy of the *Midwest Vegetable Production Guide* 2010 (ID-56)(\$10) and subscription to the *Vegetable Crops Hotline* (\$15). New members are welcome. If you have already paid separately for the ID-56 or Hotline but would like to renew or join, you may reduce your dues by the amount paid for the publications and <u>note that</u> <u>on the membership form</u>. Businesses that join at the corporate rate may send an image for inclusion on the IVGA web site Corporate page. See <www.ivga.org/ sponsors.htm> for examples and send image to <ivga@ ivga.org>.

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Midwest Vegetable Trial Report for 2009 Available - The *Midwest Vegetable Trial Report for 2009* has been published. CD's of the publication are available from the Purdue Extension Education Store at <www.extension.purdue.edu/store/> or by calling 888-EXT-INFO. Hard copies may be obtained by printing from the CD, or from files downloaded from the web at <www.hort. purdue.edu/fruitveg/rep\_pres/2009-10/toc09.shtml>. The entire book, as well as the individual reports, are available for downloading. Local printing businesses can usually print and bind for a reasonable price.

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