Indiana Liability Considerations

1. *Burrell v. Meads*, 569 N.E.2d 637 (Ind. 1991). Burrell, a long-time friend of Meads, was assisting Meads in installing a dropped ceiling in a garage. In the course of installing the ceiling, Burrell climbed onto the garage rafters to remove items stored there. He knelt on a map he believed was mounted on plywood, but which was on fiberboard. He fell to the floor, breaking his pelvis in three places. The Indiana Supreme Court adopted a rule where social guests, not on the premises for pecuniary gain, are treated as invitees. Traditionally, social guests were not afforded the same protection of invitees, who generally were either business visitors or public invitees. As a result of this case, landowners must exercise reasonable care for a social guest's protection while he is on the landowner's premises. A landowner will be subject to liability for harm to invitees if 1) the landowner knows or by the exercise of reasonable care would discover a dangerous condition on the property which involves an unreasonable risk to the invitee, 2) the landowner should expect that the invitee will not discover the danger or protect against it, and 3) the landowner fails to protect the invitee from the danger.

2. *Schwartz v. Zent*, 448 N.E.2d 38 (Ind. Ct. App. 1983). The Moshers allowed Zent to hunt on their land without charge. While hunting, Zent fired an errant shot and hit Schwartz, who was on an adjacent property. Schwartz sued both Zent and the Moshers. The hunter was found liable for $30,000 in damages. The Moshers asserted a defense under the Indiana Recreational Use Statute (IRUS). The court held that the IRUS applied even though the injured party was located on an adjacent property. This case shows the extensive nature of IRUS protection, as long as there is no fee charged, and the user is engaged in one of the activities listed in the statute.

3. *Drake by Drake v. Mitchell Community Schools*, 649 N.E.2d 1027 (Ind. 1995). The local bank owned a grain elevator and let the Kiwanis Club use it for a haunted house fundraiser. The local high school provided volunteers. Due to the dirty condition of the building, Drake contracted histoplasmosis while volunteering, and sued the school, the club, and the bank. The bank asserted a defense under the IRUS. The court explained that since the IRUS is in derogation of the common law, it must be construed in a limited fashion. The bank could rely on the IRUS only if Drake entered the elevator "to hunt, fish, swim, trap, camp, hike, sightsee, or for any other purposes." The court ruled that the bank could not enjoy the protection of the IRUS because "any other purpose" had to be within the class of recreational activities encompassed by hunting, fishing, camping, etc. Landowners cannot rely on the IRUS to limit liability when granting gratuitous access for all recreational activities.

IC 34-31-9 (Effective July 1, 2011)
Chapter 9. Limited Liability Arising From Agritourism Activities

Sec. 1.
(a) This chapter does not apply to activities if the participant is paid to participate in the activity.
(b) This chapter does not apply to an agritourism provider who does not comply with the requirements concerning signs and warning notices required by this chapter.

Sec. 2. As used in this chapter, "agritourism activity" means:
(1) an activity at an agricultural, horticultural, or agribusiness operation where the general public is allowed or invited to participate in, view, or enjoy the activities for recreational, entertainment, or educational purposes, including farming, ranching, historic and cultural agricultural activities, self-pick farms, or farmers' markets;
(2) an activity involving an animal exhibition at an agricultural fair; or
(3) natural resource based activities and attractions, including hunting, fishing, hiking, and trail riding.

Sec. 3. As used in this chapter, "agritourism provider" means
a person who provides the opportunity for agritourism activities whether or not the participant pays to participate in the activity. The term includes employees or authorized agents who offer or conduct agritourism activities on behalf of an agritourism provider.

Sec. 4. As used in this chapter, "inherent risks of agritourism activities" means those conditions, dangers, or hazards that are an integral part of an agritourism activity, including the following:
(1) Surface and subsurface conditions and natural conditions of land, vegetation, and waters.
(2) The behavior of wild or domestic animals.
(3) The ordinary dangers of structures or equipment when the structures or equipment are being:
(A) used; or
(B) stored;
by an agritourism provider in a manner and for a purpose for which a reasonable person should know that structures or equipment is intended.
(4) The negligent acts of a participant that may contribute to injury to the participant or others, including failing to follow instructions given by an agritourism provider, failing to exercise reasonable caution while engaging in the agritourism activity, or failing to obey written warnings or postings on the premises of the agritourism operation.

Sec. 5. As used in this chapter, "land" means all real property, land, and water including all structures, fixtures, equipment, and machinery located on the property.

Sec. 6. As used in this chapter, "monetary consideration" means a fee or other charge for permission to go upon a tract of land. The term does not include:
(1) the gratuitous sharing of game, fish, or other products of the recreational use of the land;
(2) services rendered for the purpose of wildlife management; or

(3) contributions in kind made for the purpose of wildlife management.

Sec. 7. As used in this chapter, "participant" means any person, other than the agritourism provider, who engages in an agritourism activity.

Sec. 8. As used in this chapter, "person" means an individual, governmental entity, corporation, limited liability company, partnership, unincorporated association, or other legal or commercial entity.

Sec. 9. An activity may be an agritourism activity whether or not a participant provides monetary or other valuable compensation to participate in the activity.

Sec. 10.

(a) Subject to section 11 of this chapter, an agritourism provider is not liable for:

(1) an injury to a participant; or

(2) the death of a participant;

resulting from an inherent risk of agritourism activities.

(b) Subject to section 11 of this chapter, a participant or participant's representative may not:

(1) make a claim against;

(2) maintain an action against; or

(3) recover from;

an agritourism provider for injury, loss, damage, or death of the participant resulting from an inherent risk of agritourism activities.

Sec. 11. Section 10 of this chapter does not prevent or limit the liability of an agritourism provider:

(1) who has actual knowledge or reasonably should have known of:

(A) a dangerous condition on the land, facilities, or equipment used in the agritourism activity; or

(B) the dangerous propensity of a particular animal used in the agritourism activity;

and does not make the danger known to the participant and the danger proximately causes injury, damage, or death to the participant;

(2) who fails to properly train, or improperly or inadequately trains, employees who are actively involved in agritourism activities and an act or omission of the employee proximately causes injury, damage, or death to the participant;

(3) who commits an act or omission that:

(A) constitutes willful or wanton disregard for the safety of the participant; and

(B) caused the injury or death of the participant; or

(4) who intentionally injures the participant.

Sec. 12.

(a) This chapter does not apply to an agritourism provider who receives monetary consideration from an individual other than a government agency unless an agritourism provider:

(1) posts and maintains a sign on which is printed the warning notice set forth in section 14 of this chapter; or

(2) has a signed release from the participant indicating that the participant has received written notice of the warning set forth in section 13 of this chapter.

(b) A sign referred to in subsection (a) must be placed in a clearly visible location at the main point of entrance to the agritourism activity.

(c) The warning notice on a sign referred to in subsection (a) must be printed in black letters, and each letter must be at least one (1) inch in height.

Sec. 13. If there is a written contract between an agritourism provider and a participant for the providing of access, services, instruction, or the rental of equipment to a participant for purposes of engaging in or participating in an agritourism activity, the contract must contain in clearly readable print the warning notice specified in section 14 of this chapter.

Sec. 14. The warning notice that must be printed on a sign under section 12 of this chapter and included in a written contract under section 13 of this chapter is as follows:

WARNING

Under Indiana law, an agritourism provider is not liable for an injury to, or the death of, a participant in agritourism activities at this location if the death or injury results from the inherent risks of agritourism activity.

Inherent risks of agritourism activities include risks of injury inherent to land, equipment, and animals as well as the potential for you to act in a negligent manner that may contribute to your injury or death, or for other participants to act in a manner that may cause you injury or cause your death.

You are assuming the risk of participating in this agritourism activity.

IC 14-22-10-2
Restrictions on landowner liability to recreational users

Sec. 2. (a) As used in this section and section 2.5 of this chapter, "governmental entity" means any of the following:

(1) The government of the United States of America.

(2) The state of Indiana.

(3) A county.

(4) A city.

(5) A town.

(6) A township.

(7) The following, if created by the Constitution of the United States, the Constitution of the State of Indiana, a statute, an ordinance, a rule, or an order:

(A) An agency.

(B) A board.

(C) A commission.

(D) A committee.

(E) A council.

(F) A department.

(G) A district.

(H) A public body corporate and politic.

(b) As used in this section and section 2.5 of this chapter, "monetary consideration" means a fee or other charge for permission to go upon a tract of land. The term does not include:

(1) the gratuitous sharing of game, fish, or other products of the recreational use of the land;

(2) services rendered for the purpose of wildlife management; or

(3) contributions in kind made for the purpose of wildlife management.

(c) As used in this section and section 2.5 of this chapter, "owner" means a governmental entity or another person that:

(1) has a fee interest in;

(2) is a tenant, a lessee, or an occupant of; or

(3) is in control of;

a tract of land.

(d) A person who goes upon or through the premises, including caves, of another:

(1) with or without permission; and

(2) either:

(A) without the payment of monetary consideration; or

(B) with the payment of monetary consideration directly or indirectly on the person's behalf by an agency of the state or federal government;

for the purpose of swimming, camping, hiking, sightseeing, or any other purpose (other than the purposes described in section 2.5 of this chapter) does not have an assurance that the premises are safe for the purpose.

(e) The owner of the premises does not:

(1) assume responsibility; or

(2) incur liability;

for an injury to a person or property caused by an act or failure to act of other persons using the premises.

(f) This section does not affect the following:

(1) Existing Indiana case law on the liability of owners or possessors of premises with respect to the following:

(A) Business invitees in commercial establishments.

(B) Invited guests.

(2) The attractive nuisance doctrine.

(g) This section does not excuse the owner or occupant of premises from liability for injury to a person or property caused by a malicious or an illegal act of the owner or occupant.

As added by P.L.1-1995, SEC.15. Amended by P.L.178-1995, SEC.3; P.L.138-1997, SEC.2; P.L.75-1998, SEC.2.

IC 14-22-10-2.5
Restrictions on landowner liability to hunters, fishers, and trappers

Sec. 2.5. (a) A person who goes upon or through the premises, including caves, of another:

(1) with or without permission; and

(2) either:

(A) without the payment of monetary consideration; or

(B) with the payment of monetary consideration directly or indirectly on the person's behalf by an agency of the state or federal government;

for the purpose of hunting, fishing, trapping, or preparing to hunt, fish, or trap, does not have an assurance that the premises are safe for that purpose.

(b) The owner of the premises does not:

(1) assume responsibility; or

(2) incur liability;

for an injury to a person or property caused by an act or failure to act of other persons using the premises.

(c) This section does not affect Indiana case law on the liability of owners or possessors of premises with respect to the following:

(1) Business invitees in commercial establishments.

(2) The attractive nuisance doctrine.

(d) This section does not excuse the owner or occupant of premises from liability for injury to a person or property caused by a malicious or an illegal act of the owner or occupant.

As added by P.L.75-1998, SEC.3.

Updated June 16, 2011

Managing Liabilities: Hunting, Recreational Use, and Trespassing

In today's world of neighbors suing neighbors, friends suing friends, your best defense to a lawsuit is being knowledgeable about these issues and areas of liability. A landowner who wants to allow others to use his property needs to know some basics about liability, how responsibility and duty towards a person will depend on their status on the land, and how potential liability can be mitigated. We will also touch on a few new areas of liability to watch out for.

Liability Basics

Two types of tort-based claims may be made against a landowner in a situation where a land entrant is injured on the land.

Negligence

Negligence is the failure to exercise ordinary care such as a reasonably prudent and careful person under similar circumstances would exercise. The four elements of a negligence claim are duty, breach, causation and damages. Under a negligence claim, the primary question is the level of the duty of care owed by the landowner to the land entrant/user. In Indiana, the entrant's status on the land will determine the duty owed by the landowner.

Strict Liability.

Strict liability, or liability without fault, is based upon the notion that some activities are so inherently or abnormally dangerous that liability should be imposed without a finding of fault regardless of whether the defendant (landowner) exercised reasonable care.

In a strict liability action, the plaintiff does not need to show a breach of duty, but does need to prove causation and damages. Typical examples of actions that will give rise to the imposition of strict liability include statutory violations, injuries caused by abnormally dangerous animals, and injuries caused by abnormally dangerous activities like blasting or transporting hazardous materials.

Status of Entrants

The first step in resolving premises liability matters is to determine the plaintiff's visitor status, which defines the duty owed by the landowner. When dealing with accidents that are caused by a condition on an individual's premises, the duty owed by a landowner to an entrant on the land is determined by the entrant's status as an invitee, licensee, or trespasser.

Trespassers

A trespasser is one who enters a landowner's premises without permission. The lowest duty is owed to trespassers, to whom the landowner only has the duty to refrain from willfully or wantonly injuring the trespasser after discovering his presence on the premises.

Wanton and willful conduct consists of either: (1) an intentional act done with reckless disregard of the natural and probable consequence of injury to a known person under the circumstances known to the actor at the time; or (2) an omission or failure to act when the actor has knowledge of the natural and probable consequence of injury and has opportunity to avoid that risk. Known probability of injury is the key to the consideration of wantonness.

Landowners should avoid any unnecessary force or malicious conduct when deterring or removing trespassers. In addition, if there is a dangerous condition that is known, there may be a duty to warn known trespassers. For example, suppose trespassers cross a private, wooded lot between two state forests so often that a trail has been cut. The landowner may have a duty to warn of large holes located to the side of the trail, and certainly cannot conceal the holes in an attempt to harm the trespassers.

Note that Indiana Code 35-43-2-2 provides that criminal trespass only occurs if the trespasser is on notice, either personally or through posting to the general public. If your land is posted, the sheriff can be called to assist in removing the trespasser from the land.

Licensees

A licensee enters onto a premises for his own convenience, curiosity, or entertainment. However, in contrast to a trespasser, a licensee is privileged to enter or remain on the land by virtue of the owner's or occupier's permission.

The landowner owes a licensee the same duty owed to a trespasser, but the landowner must also refrain from acting in a manner that increases the licensee's peril. More specifically, the landowner must warn a licensee of any latent (i.e. not obvious) danger on the premises of which the landowner has knowledge. Without the Recreational Use Statute, a landowner could be liable to a hunter allowed to enter the property and injured by a latent danger on the property by virtue of the hunter's status as a licensee.

Invitee

The highest duty is owed to an invitee. An invitee may fall within one of three categories: public invitee, business visitor, or social guest. Traditionally, social guests were classified as licensees. However, in *Burrell v. Meads*, Indiana created a higher duty for hosts towards their guests. a landowner must exercise reasonable care for the protection of the invitee while on the premises. A landowner will be liable if he:

> (1) knows or by the exercise of reasonable care would discover the condition, and should realize that it involves an unreasonable risk of harm to such invitees;
> (2) should expect that invitees will not discover or realize the danger, or protect themselves against it; and
> (3) fails to exercise reasonable care to protect the invitees against the danger.

Attractive Nuisance and Children

A different standard is used when children are involved. While Indiana courts have noted that a landowner is not an insurer of the safety of children, the court will consider the ability of a child to perceive and avoid danger in evaluating the owner's liability for a child. The child's ignorance of the danger in such a case would trigger the duty to warn on the occupier of the land, even though there might be no duty to warn an adult in the same position.

The doctrine of attractive nuisance applies when:

(1) the structure or condition complained of is maintained or permitted upon the property by the owner or the occupant thereof;
(2) the structure or condition is dangerous to children and of such a nature that they will not comprehend the danger;
(3) the structure or condition is particularly attractive to children and provides a special enticement for children to play or sport thereon;
(4) the owner knows or should know of the existence of such structure or condition, and that children do or are likely to trespass upon his property and be injured by such structure or condition; and
(5) the injury sustained is the natural, probable and foreseeable result of the original wrong complained of.

Natural conditions and bodies of water are not subject to the doctrine of attractive nuisance. In addition, the doctrine is inapplicable when children are under parental supervision.

Reducing Liability

Limited Liability Arising from Agritourism Activities

The new statute provides limited liability protection to landowners engaged in agritourism, including operations receiving monetary consideration such as admission fees or the sale of goods, provided that specific warning signage and language are used. The protection relates to injury, loss, or death resulting from the inherent risk of agritourism activities. The statute is codified as Indiana Code 34-31-9 and effective as of July 1, 2011. The statute provides limited liability protection for commercial agritourism activities that is not available via Indiana's Recreational Use Statute (IRUS).

To utilize the statute's liability protection, an agritourism provider receiving monetary consideration for admission must:

- Post and maintain a clearly visible sign near the main entrance for the activity including the statute's specific warning language written in at least one-inch black letters
- Or obtain a signed release from the participant indicating the participant received written notice of the specific warning

The required warning language includes:

WARNING

Under Indiana law, an agritourism provider is not liable for an injury to, or the death of, a participant in agritourism activities at this location if the death or injury results from the inherent risks of agritourism activity.

Inherent risks of agritourism activities include risks of injury inherent to land, equipment, and animals as well as the potential for you to act in a negligent manner that may contribute to your injury or death, or for other participants to act in a manner that may cause you injury or cause your death.

You are assuming the risk of participating in this agritourism activity.

The statute does not prevent liability when the agritourism provider:

- Knew or should have known of dangerous conditions or animals on the land, facilities, or equipment used in the agritourism activity and fails to warn the participant of the danger
- Fails to properly train agritourism employee(s) and the employee's actions or inactions cause the participant's injury or death
- Exhibits willful or wanton disregard for the safety of the participant resulting in the participant's injury or death
- Intentionally injures the participant

To date, no legal cases have specifically addressed the statute. Thus, how courts will interpret the statute is still to be determined.

Indiana Recreational Use Statute (IRUS)

The IRUS is a set of two statutes that protects landowners from liability to a person or property caused by an act, or failure to act, of other persons using the premises. Indiana Code 14-22-10-2 applies to someone spelunking, swimming, camping, hiking, and other recreational purposes. Recreational activities not typically of the kind that occur in parks and other natural areas are not covered by this statute. That is, sledding is included under "other recreational purpose," but using a structure as a haunted house is not. Indiana Code 14-22-10-2.5 applies to those hunting, trapping, or fishing.

The IRUS does not protect landowners from all liability. It does not abrogate the attractive nuisance doctrine, liability due to intentional or malicious acts, or the duty of care owed to business invitees or social guests. The IRUS does not apply if there is a fee charged for the use of the land.

Waiver

Indiana has long recognized the validity of exculpatory contracts, where parties are allowed to agree in advance that one is under no obligation of care for the benefit of the other and shall not be liable for the consequences of conduct which would otherwise be negligent. Such releases will be found void as against public policy only where there is unequal bargaining power between the parties such that the party against whom the release is being enforced did not knowingly and willingly execute the release or when there is evidence of fraud or misrepresentation.

The status of waivers executed on behalf of minors is uncertain in Indiana. However, landowners should assume that parents or guardians may not waive liability on behalf of a minor. In such cases, the landowner should request that the parent or guardian indemnify the landowner for any liability asserted on behalf of the minor. This provides an additional measure of protection; however, understand that a landowner would still be subject to liability in excess of the parent/guardian's assets.

Insurance

Insurance policies, such as Indiana Farm Bureau's Rural Guardian policy, can protect landowners from substantial amounts of liability. Endorsements may be required for activities such as leasing for hunting, agritourism enterprises, and other activities. Read your policy carefully for exclusions and conditions.

Common Sense

Some simple risk management measures can also do much to lessen a landowner's liability exposure. Because landowners are so familiar with their own properties, they often forget that what is an obvious danger to them is not necessarily a danger to a visitor to the property. Farmers and ranchers often overestimate the common sense that visitors will exercise.

The following are some of the things you can do to reduce risks of injury or property damage:

(1) Conduct routine safety audits of your property. Whenever possible remove potentially dangerous objects, such as a rusty but sharp piece of old equipment.
(2) Fill in abandoned wells or other dangerous holes.
(3) When corrective measures are possible, be sure to fence off dangerous areas and, if that is not possible, at least post obvious warning signs.
(4) If you have made your property available to multiple hunters at one time, make sure they are all aware of each other's presence, where they will each be hunting, and that they are wearing highly visible safety clothing.
(5) As much as possible, keep domestic livestock (including bucks/bulls in rut) and recreational users apart. Get rid of, or at least completely secure, any ill-tempered or vicious animals, including watch dogs.
(6) Secure all attractive nuisances, such as barns and working machinery. Many recreational users bring their children with them. You can be held liable if the children are injured, even if their parents were negligent in supervising them.
(7) Establish and post guidelines of behavior for land entrants. For example, if you require children to be constantly supervised by parents you should say so in writing. The same is true if you forbid access to certain parts of your property, or the use of alcoholic beverages. Just as important, require anyone who violates your rules to immediately leave the premises.
(8) Make sure you have emergency equipment and supplies handy in case anyone is injured.
(9) Carefully screen all of your potential employees and train them as to their duties and responsibilities in dealing with recreational users.
(10) Make sure that some of your employees, or you, are trained in life saving and other emergency response measures.

BUSINESS TO CONSUMER E-COMMERCE: SELLING ON THE INTERNET

Buying and Selling Online is Here to Stay!

A true story . . . a 40-something woman working full time and living in a small rural town decided during the 1999 Christmas season that she did not have the time or energy to go shopping in the traditional way. This year she vowed she would try an alternative shopping method and purchase ALL Christmas gifts over the Internet. And that's exactly what she did. She found everything she was looking for and more, she saved time, she saved money, she did not have to drive two hours to a mall, she did not have to battle holiday crowds, and everything she ordered was delivered on time and to her doorstep. Her conclusion --- it was the most pleasurable holiday shopping experience she had ever had --- it was the most pleasurable way to shop, period --- and that's the way she intends to shop year-round now.

There's no doubt about it. The way we buy and sell consumer goods is changing -- and it's changing quickly! The reason for the big change can simply be explained with one word, Internet. Estimates indicate that approximately 600 million people are online worldwide. By the year 2005, the global Internet population will reach 1.17 billion. [1] In a report released by the U. S. Department of Commerce, U.S. retail e-commerce, or e-tail, sales for 2003 were 1.6 percent of total retail sales. [3] E-commerce in the U.S. generated $54.9 billion in 2003, a 26 percent increase over 2002. Research by Forrester stated that e-commerce sales will increase at a steady 19 percent year-over-year rate, rising to $229 billion in 2008. By 2008, online retail sales will account for 10 percent of total U.S. retail sales.

Why are people buying products over the Internet? A survey of Internet shoppers gave the following reasons [5]:

- Ease of placing an order
- Large selection of products
- Cheaper prices
- Fast service and delivery
- Detailed and clear product information
- No sales pressure
- Easy payment procedure

What are people buying over the Internet? The following product categories are currently selling: [6]:

- Airline tickets
- Hotel reservations
- Computer hardware
- Apparel
- Consumer electronics
- Car rental
- Health/Beauty
- Books
- Music
- Computer software
- Jewelry
- Toys/Video games
- Food/Beverage
- Office supplies
- Flowers
- Linen/Home decorations

- Sporting goods
- Videos
- Appliances
- Furniture
- Tools/Hardware
- Footwear
- Small appliances

What does all this mean to small business? It means the Internet is a new way to expand business opportunities. It is proving to be a great equalizer, allowing the smallest of businesses and those in rural locations to access markets and have a presence that allows them to compete on equal footing. It also means businesses should watch this trend and develop a strategy to position themselves in the new Internet economy. In developing a strategy, first ask, Does the business need a website? and, What does the business want to accomplish by establishing a website? Don't make the mistake of hurriedly creating a website without serious thought and business planning.

Small businesses are using the Internet to create new markets, provide information about products/services 24 hours a day, service customers, get customer feedback, and sell products. Basically, these can be boiled down into three main reasons why businesses establish websites: marketing, customer support, and sales.

Many businesses have sites that create a presence on the web and are what some term a "brochure" site. They serve as an advertising/promotional tool for the business, providing information about the business but not actually selling products online. The Internet has significantly reduced the cost associated with obtaining information about products, and many people use the Internet to research products and then purchase them off line. A website may provide a telephone number and/or fax number for actual ordering. Many companies have found this type of website an effective tool for servicing customers by providing product information and specifications, providing answers to frequently asked questions, and communicating with customers. Some businesses start out with brochure sites and grow into full-service transactional sites.

A full-service transactional website not only creates a web presence, it also is designed for accepting and processing orders online in real time.

Like any other marketing or sales effort, setting up and running a business website will cost money. The cost can range from next to nothing to thousands of dollars, depending on the purpose of the site, size of the site, how much is done in-house, and how much is out-sourced. The bottom line is that a small business with a well thought-out strategy and plan can be doing business online in a short period of time and for a reasonable amount of money.

While the traditional ways of doing business should not be totally abandoned, given current trends and predictions, it is essential that small businesses embrace the use of the Internet as a vehicle for sales. The businesses that position themselves now for a technology-driven future increase their chances of survival.

What Do E-Customers Want?

A true story . . . two years ago a first-time Internet shopper decided to check out amazon.com to see what all the hype was about. While at the site, he had a blast because it was so easy to navigate and he was able to check out books and authors, and read reviews by people just like him. He quickly realized that he literally had access at his fingertips to any book in print. And on top of that, the prices were reasonable! He had so much fun that within 15 minutes he had purchased three books. That same day, amazon.com sent him an e-mail summarizing his order and thanking him for shopping. The next day amazon.com sent him another e-mail letting him know that his

books had been shipped and when to expect them. A few days later, the books were in his hands. The next time he needed a book, it was back to amazon.com. and as the screen popped up, it greeted him with a hello, using his name, and there was even a list of books they thought he might be interested in. He made another purchase, and this time used the 1-click method. In less than two minutes, he had purchased two books. What was all the hype about? A company that puts its customer FIRST in every way!

Do what amazon.com does, and you won't go wrong. Online imitation is not just the sincerest form of flattery -- it's good business. Value the customer above all else. Be customer-centric. Steve Strauss

An important question that needs to be answered before an electronic e-tail website is created is, Who are the people that will be visiting my website? Or, who is my customer or target market? The more you know about your target market, the more you can adjust your website contents. For instance, is the purpose of your website to provide information or to market and sell a product or service? These are two very different objectives and creating a website to address each objective may result in significantly different end products.

Before you start building your electronic storefront, do your homework. Go to the web and look very closely at existing e-tail sites. Evaluate them from a customer standpoint. Here's what customers say they want:

- Clear/accurate product information and representation
- Real-time answers through self-help features and toll-free telephone numbers
- Good prices and clear representation of all charges
- Secure transactions
- Easy to use return/exchange policy
- Quick processing and delivery time
- Elimination of unknowns

Shopper privacy

A good place to start is with some of the most successful business sites, such as amazon.com and qvc.com. Even if your online business is going to be much smaller in scale than these sites, there are still lessons to be learned from them such as site design from a selling and customer standpoint. In addition, Internet and e-tail customer research can provide guidance in website development. According to a recent report on e-commerce from Forrester [7], exceptional customer service strongly increases future sales through return visits and word-of-mouth. The study showed that 90 percent of satisfied customers are likely to visit again, and 87 percent will tell family and friends about the site. A report by Jupiter [12] said 45 percent of online shoppers choose Web sites based on word-of-mouth recommendations. The Forrester [7] report further indicated that Internet shoppers expect e-commerce sites to have customer service readily available throughout the buying experience.

So when it comes to building an e-tail web store, the question becomes, Precisely what do e-customers want? Internet shoppers want the following:

- Fun and easy to navigate sites -- make the shopping experience at your e-tail site a pleasurable experience by making it user-friendly and easy to navigate. The site should be concise and informative. Potential customers may be reluctant readers, and by encumbering them with volumes of information, you may just encourage them to go elsewhere. Remember the three-click rule: If a customer can't accomplish what he or she wants to do within three clicks, then the system isn't working right. [8]

- Quick download time -- A major complaint among Internet users is long load times. Research indicates that 80 percent of web users cite download time as the number one

problem. [9] Pages should be fast-loading and not keep customers waiting. A couple of seconds is ideal, 10 to 15 seconds is ok, but take more than 20 seconds and your customer is gone. Keep in mind as you design your site that most consumers are connecting to the Internet via slow modems and large graphics increase load times. Recent studies indicate that slow-loading websites cause online consumers to abandon up to 50 percent of online transactions. [10]

- Pages that appear professional -- clean and simple is better than cluttered and complicated. In e-tail, you are selling and your site should be designed to display and highlight what you are selling. The web store should reflect good use of the elements art and principles of design, while at the same time be designed for online shopper usability. Don't get caught up in the latest bells, whistles, glitz, and flash at the sacrifice of service and sales.

- Clear and accurate product information and representation -- since customers cannot actually see, touch, and feel products in person, the graphic representations must be clear and visually accurate. Product descriptions must be thorough and eliminate any guessing. The more clearly and accurately you represent your products on your web store, the less time you will have to spend answering questions about products and restocking returned merchandise from dissatisfied customers.

  Another feature that web shoppers find helpful is displaying an in-stock inventory count for products, particularly for items that tend to be in short supply. Shoppers do not want to waste time ordering an item that is not even available. Inventory software is available that can make this an automated function on your website.

- Real time answers through self help features, e-mail, and a toll-free telephone number -- Internet shoppers want answers and they want them quickly. E-mail and the telephone are the most used and the most preferred forms of contact, with e-mail ranking first. In both circumstances, it is key to customer satisfaction that someone be available to answer questions in a timely manner, preferably in real time. Real people providing real time answers add a human touch to doing business. Even online shoppers still prefer doing business with real people. According to a study by Jupiter Communications, 47 percent of people are more likely to buy online with the addition of real time interaction. [11]

  However, many Internet shoppers prefer to find the information about products themselves. Provide easy-to-find answers to anticipated questions such as product information, minimum orders, shipping, warrantees, and pricing schedules. You must design your storefront so customers can easily find answers to their questions at your site, not your competitors. Offer self-help through the use of searchable databases, online videos, and frequently asked question and answers sections.

  Ideally, web-based customer service should include both self help and real time or live help capabilities. [11]

- Good prices and clear representation of all charges -- price is a major factor in closing a sale, so your prices must be competitive. Any additional charges such as shipping, handling, special delivery, gift wrapping, custom or special orders, etc. should be clearly presented to the customer.

- Payment options -- most Internet shoppers want to buy online in real time; however, there are people who prefer to purchase using an alternative method. Offer customers various means of ordering and paying for the items they select. You should offer the visitor

the opportunity to order online, by telephone number (preferably a toll-free number), by fax, or by mail.

- Secure transactions -- customers consistently indicate credit card security is a primary concern when shopping online. Statistics indicate that you lose 50 to 60 percent of potential sales when you don't offer a secure transaction site. Include a statement about your website's security system to help alleviate fears of using a credit card online to make a purchase.

- Easy to use return or exchange policy -- online shoppers want the same or even better return and exchange policies that they are used to receiving in traditional retail. Your return policy should be clearly stated on your e-tail website and should be as liberal as possible given the merchandise you are selling.

- Quick processing and delivery time -- "we want it now" is the motto of Internet shoppers. It is critical that you have a delivery plan and system in place before you go online with your business. Inform customers as to when they can expect delivery at the time they place the order and after they place the order. Send another email message the day the product is actually shipped. Follow-up communication via e-mail is a frequently used and proven model for e-commerce.

- Shopper privacy -- many consumers are concerned about protecting personal information and are leery about how the information they provide at e-tail sites might be used. Consider posting a privacy statement or policy on your website, explaining to customers what information you collect about them and how you use it. Remember that from an ethical standpoint, if you post a policy, it is your responsibility to follow it.

Getting Started Building A Web Store

Usability rules the web. Simply stated, if the customer can't find a product, then he or she will not buy it. The Web is the ultimate customer-empowering environment. He or she who clicks the mouse gets to decide everything. It is so easy to go elsewhere; all the competitors in the world are but a mouseclick away. Jakob Nielsen

As with any business venture, there must be something to sell -- a product, service, or combination of the two. And as with any business venture, the more planning that goes in on the front end, the higher the chance of business success. These same principles hold true for e-commerce, whether it be a new virtual business or an existing business wanting to expand by selling via the Internet.

The information covered in this document provides the basics of how a small business can establish an electronic retail website. This information is intended as a starting point for the many businesses thinking about going online but don't know where to begin. Establishing and maintaining an e-commerce website takes a lot of research, planning, and plain old hard work. However, the rewards can be great!

A small business venture that establishes a website or web store that represents their products AND actually accepts and processes orders online is called a transactional e-tail website. This type of online selling basically requires:

- a domain name/web address
- a web store
    - online product catalog
    - ordering system/shopping cart
    - merchant account/payment processing

    - customer communication system
    - tracking system
- a web server/host
- site marketing

Domain Names

Early in the process of setting up an e-tail site, you need to decide on the domain name for the business, which is the name that will be in the URL (universal resource locator). The URL is the web address or location on the Internet for your e-tail website -- www.yourname.com. The name you choose is important. It should reflect what you sell and be easy for customers to remember. Once you have chosen your name, the next step is to see if it is available. If the name is available, you need to register it. Domain name extensions most commonly used for business sites include:

- .com - a general domain extension intended for commercial use;
- .net - a general domain extension primarily used for Internet infrastructure organizations/companies;
- .org - a general domain extension primarily used for not-for-profit organizations;
- .biz - a general domain extension intended for businesses;
- .info - a general domain extension intended for both commercial and non-commercial use;
- .pro - a restricted domain extension intended for use by certified professionals and professional entities.

There are free websites that allow you to search domain names and determine if a specific URL has already been registered. For example, the register.com and networksolutions.com sites allow you to search domain names to determine if a particular website address has been registered.

If the name has not been registered, you can register the domain name with one of the many registrars (companies that can provide domain name registration services). To view a list of all entities accredited by ICANN (Internet Corporation for Assigned Names and Numbers) to register names in .com, .net, and .org, refer to the ICANN List of Accredited and Accreditation-Qualified Registrars.

Registration gives you the right to a particular domain name for a specified number of years after which it has to be renewed annually. Currently, initial and renewal registrations are available in one-year increments, with a total registration period limit of ten years. Compare the different companies fees and accreditation and use the one with which you feel most comfortable.

According to InterNIC, the Internet domain name system (DNS) consists of a hierarchically organized directory of all the domain names and their corresponding computers registered to particular companies and persons using the Internet. When you register a domain name, it will be associated with the computer on the Internet you designate during the period the registration is in effect.

Registering your domain is a simple process that can be accomplished in a short time, so put your time and effort into coming up with just the right name. You have heard the saying, What's in a name? -- Everything! When it comes to selling on the Internet, this can be very true. Your customers need to know how to reach you without having to think about it. So choose a name and choose it carefully -- think like a customer!

It is important from a business standpoint to have your own unique domain name. Using your company's name or your product's name in your domain name makes it easy for customers to recall and remember the name at a future date. Including additional characters or words in the domain

name only increases the likelihood of customers not being able to accurately recall your complete domain name. Some web hosting services and electronic shopping malls will help you get your site up and going, but your name is embedded within their domain name -- www.theirname/your-name.com. Try to avoid this set up because it is often hard for customers to find your site and hard to build your own web identity.

Another issue to consider is buying multiple domain names or variations of the name you choose. For example, if you were growing and selling all varieties of red roses, a natural choice would be redroses.com. Variations might be red-roses.com, redrose.com, etc. You may also want to consider registering the name as a .com, .net, and .org. That means you have to register (and pay for) each domain name separately. However, from a business standpoint, that is a small investment to protect yourself from lost sales to a competitor who registers a variation of your domain name to draw your customers to their site. If you do register multiple domain names, each domain name can be structured so that it directs the customer to a single website. Registering multiple domain names does not necessarily mean multiple websites have to be developed.

[Note: For more detailed information and answers to frequently asked question regarding domain names, go to the U.S. Department of Commerce's InterNIC, website.]

Online Product Catalog

Your web store is more than just a website -- it must be designed from an e-tail perspective and contain features that make it easy to access and buy products. First it needs to contain an online product catalog that offers good quality and accurate graphic representation of each product you are selling. This is fundamental to selling on the web. Remember that customers cannot touch and feel your products, they can only see what is up on their screen, so products must look good and make customers want to buy them. (Many businesses that are already selling via mail order catalogs are a natural for selling on the web. They already have a print catalog that they can adapt to a virtual catalog as well.)

Keep in mind that download time for any website should be quick. Internet shoppers are impatient and don't want to wait more than a couple of seconds. Keep your graphic files as small as you can without distorting your product images. Many sites use small graphics that when clicked, open to a larger view of the product.

Ordering System/Shopping Cart

Incorporate an ordering system that is easy to use to allow customers to pick and choose the products they want to order from your online catalog. To date, the most successful online shopping model is the shopping cart ordering system. The electronic shopping cart is modeled after the way most of us shop for groceries in the United States -- with a cart that we fill with products as we push it around the store. The online shopping cart system allows customers to place items they choose into their own personal virtual shopping cart. When online customers are through shopping, they then proceed to check-out where items are totaled, including shipping/handling and any other charges. If you are building your own web store, there are many software packages available that utilize the shopping cart model. Shopping cart software ranges in price from free to thousands of dollars depending on the quality and functionality. Look for a fully integrated software package that takes the process all the way from product selection to order total.

Merchant Account/Payment Processing

Many online businesses have had difficulty establishing a "merchant account," a special type of bank account that holds the proceeds from credit card transactions. Without a merchant account, web businesses can't accept credit cards and may miss out on more than 60 percent of their sales

opportunities. David Johnson

Currently, credit cards are the quickest and most efficient way to accept payment for online purchases. The two ways for accepting credit cards for online purchases are manual processing and real time processing. In manual processing, the online customer enters the credit card number for payment of purchase. The information is sent to you and the transaction is processed by hand with a terminal keypad. You enter the numbers into the terminal where it then connects to a processing network and returns the status as approved or declined.

In real time processing, the customer enters the credit card number and the transaction is processed entirely online. After the transaction has been completed, the processor will deposit the money from the transaction into your bank account. The process for accepting real time credit card payment via the Internet requires communication between your web store shopping cart and payment processor using your merchant account. It is critical that these functions are compatible with one another.

Either way, you need to set up the ability to accept credit card payments online by establishing a merchant account and a way to process payments. There are many services set up to do this for small e-tail businesses. Go to a search engine and type in "merchant account" and a long list of merchant account and processing service providers will come up. Compare and evaluate companies in terms of costs (set-up fee, per transaction fee, percentage of sales, monthly/annual fee), secure transactions, how long they have been in business, compatibility with your system, and the services they provide (an impartial listing of merchant account providers can be found at MerchantWorkz.com). It is easiest and simplest to go with a fully integrated service that provides you with the merchant account and payment processing at a secure location; however, this can be more expensive.

From a customer standpoint, having a secure site where they actually submit their credit card number is critical. This is done by using a SSL (Secure Socket Layer) secure server where the transactions take place. Insuring secure transactions is currently the number one customer issue when it comes to buying online. Experts say that you lose 50 percent to 60 percent of potential sales when you don't have a secure transaction site.

Customer Communication System

In addition to an ordering system, your web store needs to incorporate a way to communicate with customers. There should be a telephone number on each web page where customers can call with questions and there should be an easily accessible e-mail system where customers can send questions. A recent study by Forrester indicated e-mail and the telephone were the most-used and the most-preferred form of contact, with e-mail ranking first. In both circumstances, it is key to customer satisfaction that someone be available to answer the questions in a timely matter --- within 24 hours or less. Remember, your competition is just a click away!

The communication system you incorporate should have a mechanism that e-mails customers once they have placed an order, thanking them and letting them know when to expect shipment. The customer database can also be used to send customers information about new products, sales, etc. This communication system should be as automated as possible.

Tracking System

In addition to a communication system, the web store should incorporate a system that tracks each customer order from placement through delivery.

Web Server/Host

Once your e-tail website is designed and ready to go, you must have a place for it to reside, or an ISP (Internet Service Provider) to host it. The two basic choices are to purchase your own web server or "rent" space on a web server. The key word here is web server -- not just any server will do. The first choice, buying your own server, can be costly both in initial hardware and software and in maintaining the system. If you don't have the necessary skills, you will have to hire someone to set up and maintain your server for you, and that can be quite expensive. Most small businesses choose to rent space on a server. Either way, you will pay a monthly fee to an ISP to host your site or your server. It is important to start locating the ISP while you are working on your web store. Don't wait until you have your web store done. Make sure that the service provider has adequate space, bandwidth, reliability, knowledge, and capability to handle a transactional e-tail website.

Outsourcing and Web Building/Hosting Services

Many e-commerce solutions providers have teamed up with ISPs and Web hosting services, a trend that is certain to make it very easy for you to find a one-stop solution for doing business on the Internet. These new partnerships often combine site hosting and store set-up and credit card processing into a single package specifically designed for e-commerce beginners. E-Commerce-Times

At this point, if you have decided that you do not have the time, talent, staff, or inclination to build your e-tail website in-house, then do what many small businesses do and out-source it to a company or person with expertise in building websites. Make sure that whoever you hire not only knows how to build websites, but they also know how to build e-tail websites. There is a lot more to building a site for doing commerce on the Internet than building a personal web page or an informational web page for a business. Always take an online look at work they have done and evaluate it before you hire someone for your business. The cost to out-source your website design will vary from a couple hundred dollars to thousands of dollars depending on the complexity of site, size of site, who you hire, and what you want done.

Another option -- what some call the "one-stop" method of getting an e-tail website up and going for minimal costs and in minimal time -- is to use a web building/hosting service. These are services that take you through the entire process of setting up your web store starting with securing your domain name and going all the way through the marketing of the site. These companies provide templates for designing your web store, shopping cart software, forms, a place to host your site, a source for setting up a merchant account and processing, secure transaction locations, and more. Go to a search engines and type in "web hosting service" and a long list of web hosting service providers will come up. Compare and evaluate companies in terms of costs, services they offer, and ease of use. This is a real option for many small businesses, especially those companies that don't have a large number of different products to sell, have a small budget dedicated to this effort, or just want to start out on a small scale.

Design and Technical Considerations

There are many design and technical issues that need to be considered when designing a website. The more knowledge you have before building your site, the better your site will be. The following are some of the more critical issues to consider:

- Bandwidth -- bandwidth affects the speed with which a user can access the Internet. The dominant design criterion should be download speed in all web projects until about the year 2003. [5] Design your website for the masses aiming at optimal usability over a 56K modem. Apply the KISS rule to your website -- Keep It Short and Simple! The more you use large graphics, animation, video streaming, audio streaming and other multime-

dia design features, the slower the download time. Recommendations are to keep page sizes (file sizes) below 34K to prevent loss of viewers. [5] Internet customers don't like to wait!

- Browser Compatibility -- design your website so that it looks good on all browsers. What looks OK on Netscape might not look OK on Internet Explorer or AOL browsers. And what looks OK on Netscape 4.0 might not look OK on Netscape 3.0.

- Color Palette -- color configuration varies from computer to computer from multi-million color displays to 256-color and 16-color monitors. For consistence in graphical appearance, it is recommended using a 256-color/16-color default in your web design.

- Continuity -- the overall look of the website should be consistent from page to page. There should be a unified look and feel as the user navigates within the site. Pages should incorporate similar layout, logos, fonts, colors, styles, graphics, etc., creating a comfort factor and a sense of familiarity with customers.

- Frames -- avoid using frames in the design of your site. Frames decrease the dynamic space you have to work with, thereby decreasing the amount of space for featuring products. They often present navigation problems for the user, some browsers cannot print framed pages accurately, and search engines have trouble with framed sites.

- Home Page -- the most prominent design element on the home page should be the name and logo of the company. They should also appear in smaller scale on every page of the website. In addition, a business website should provide customers with a brief description of the business and available products. Briefly describe any unique aspects of your business from inception to the current operation to include unique manufacturing, service, distribution, and other processes. This type of seemingly useless information provides your company the opportunity to differentiate itself from competing products. Be careful not to overdo it; too much seemingly useless information may actually become useless if you cannot retain the customer's interest.

- Navigation -- use directories, site maps, and navigation bars throughout your site. Be consistent in your format from page to page. The goal is to enable customers to move around your site with ease. No matter where a customer is on the site, they should be able to get wherever they want to go quickly. According to an internetday.com article 20 to 40 percent of users don't purchase because they can't figure out how to easily move around the website.

- Page Width -- do not design for a specific screen width. Experts recommend creating page layouts that will work across a range of window sizes -- a resolution-independent page which can adapt to various screen sizes. However, if this is not possible or you do choose to design for a specific size, at least for the immediate future stay with the current standard page size of 800 x 600 pixels. Currently, about 93 percent of the web population can view a page at 800 x 600 without unnecessary scrolling. [13] Taking into account the actual viewable browsing area, this means you would design pages that are about 770 x 430.

- Readability -- design your site so that it is easy to read. The background should not impair the visitor's ability to read and see the information on the page. Use colors with high contrast between the background and text. For example, a black background with dark blue text can make reading extremely difficult. Don't use patterned backgrounds that interfere with the ability to read information and see products. Use fonts that people can see and read easily. Be brief, concise, and succinct in your writing. Make your words

count. Use short paragraphs and bulleted lists. The rule of thumb when writing for the web is to reduce by 50 percent the amount of text used to write the same material for print.

- Screen Compatibility -- screen size and resolution vary from user to user. Design your website so that it will look good on all screen sizes and screen resolutions.

- Text Only Default -- ten percent of Internet users are using text-only browsers. A well-designed website will include a text-only option that will display alternate information for browsers without graphics capability. In addition, a text-only version of your site makes it easier for visually-impaired users to access your information with a talking browser that reads the text aloud.

- Accessibility -- a website should be designed so that it is accessible to people with disabilities. For example, consider the following design issues that affect Web site accessibility:

    - The visually impaired use special readers that read only text.
    - Blinking text can trigger seizures in some visitors.
    - Poor color choices may render text unreadable to color blind visitors.
    - Mouse-dependent site navigation can be difficult for visitors with physical limitations.
    - Information contained in sound clips is inaccessible to hearing-impaired visitors.

- Bobby is a web-based tool that analyzes web pages for their accessibility to people with disabilities. The Center for Applied Special Technology (CAST) offers Bobby as a free public service in order to further its mission to expand opportunities for people with disabilities through the innovative uses of computer technology. To analyze your web site, go to www.cast.org/bobby and type in the URL of the page that you want Bobby to examine and click submit. Bobby will display a report indicating any accessibility and/or browser compatibility errors found on the page. Additional information regarding accessibility for the disabled is available through the Web Accessibility Initiative (WAI).

- User Interface -- a website must be easy to use, period. Ease of navigation is critical. And the easier and more logical you make this process on your site, the happier the user will be. Navigation interfaces need to help customers answer three fundamental questions relative to the web as a whole and relative to the site's structure [*5*]:

    - Where am I?
    - Where have I been?
    - Where can I go?

There are several excellent books on the market that address these issues and more:

Collaborative Web Development: Strategies and Best Practices for Web Teams
Jessica R. Burdman

Designing Large-Scale Web Sites: A Visual Design Methodology
Darrell Sano

Designing Web Usability: The Practice of Simplicity
Jakob Nielsen

Information Architecture for the World Wide Web

Louis Rosenfeld and Peter Morville

Designing Large-Scale Web Sites: A Visual Design Methodology
Darrell Sano

Web Concept & Design: A Comprehensive Guide for Creating Effective Web Sites
Crystal Waters

Site Marketing

So the storefront is open, the banner is flashing, the products are ready, but the cart is still empty. What to do? How do you get customers to your site? Don't despair. There are many ways to drive eyeballs to your new e-commerce site. Steve Strauss

"Build it and they will come!" They may, and then again, they may not. You must put some effort into marketing your e-tail web store. Many companies are not satisfied with their website as a marketing and sales tool. It is not unusual for a business to expend significant resources constructing a professional website only to leave it unattended. To make your website work, it must be a critical part of your marketing plan and receive the same attention other components receive. The website needs to be updated periodically and marketed continually to be successful. There are millions of websites on the Internet, and without rigorous marketing, the chances of your site generating the desired level of customer traffic and/or sales is quite small. The key is to get your site known so potential customers will come and take a look. There are several things that you can do to increase the hits on your site.

Submit your site to the "big 3" search engines (alltheweb, alta vista, and Google), and the Yahoo! directory. You need to be listed with the search engines because this is the number one way people find sites selling products they are interested in purchasing. It is estimated that 85 percent of all web users find sites via search engines [7]. To submit your site, go to the main page of the search engine and click the button for site submission. For example, yahoo.com has a "How to Suggest a Site" link at the bottom of their page that takes you to a page of instructions on how to do it.

When you submit your URL to search engines, don't expect your site to show up immediately. Some search engines take a while before your listing shows up. A month or so after submitting your URL to search engines and directories, check to make sure it is listed properly. Some search engines and directories have links that allow you to verify that your website has been registered. Don't stop there; it is important to frequently check on your website pages as pages sometimes disappear, dead links may develop or the page may be deleted from a search engine or directory catalog.

For optimal indexing of your website by search engines, Dr. R. F. Wilson of Web Marketing Today recommends the following:

- Write a Page Title. Write a descriptive title for each page of five to eight words. Remove filler words from the title, such as "the" and "and." This page title appears on the Web search engines when your page is found. Entice surfers to click on the title by making it a bit provocative. Place this at the top of the Web page between the <HEADER></HEADER> tags, in this format: <TITLE> Web Marketing Checklist -- 26 Ways to Promote Your Site </TITLE>. Hint: use some descriptive keywords along with your business name on your home page. Instead of "Acme Cutlery, Inc." use "Acme Cutlery -- Pocketknives, Butchering Sets, and Kitchen Knives." The more people see in the blue highlighted portion of the search engine that interests them, the more likely they are to click on the link.

- List Keywords. To get your juices flowing, sit down with some associates and brainstorm a list of 50 to 100 keywords or keyphrases -- the kind of words or phrases someone might search on to find a business or site like yours. Then refine the list to the most important 20 or so. Place those words at the top of the Web page, between the <HEADER></HEADER> tags, in a META tag in this format: <META NAME="KEYWORDS" CONTENT="promoting, promotion, Web marketing, online sales ... ">. Note, however, that some research on search engine algorithms indicates that a fewer number of keywords may help you better target the most important search if you're working to increase your page's ranking on the search engines. Consider using both lowercase and capitalized forms of your most important words, since some search engines are capitalization-specific. Make sure you don't repeat any word more than three times so you're not penalized for "keyword spamming."

- Write a Page Description. Select the most important 20 keywords, and write a careful 200 to 250 character (including spaces) sentence or two. You don't need to repeat any words used in the page title. Keep this readable but tight. Eliminate as many filler or throwaway words as you can (such as: and, the, a, an, company, etc.) to make room for the important words, the keywords which do the actual work for you. Place those words at the top of the Web page, between the <HEADER></HEADER> tags, in a META tag in this format: <META NAME="DESCRIPTION" CONTENT="Increase visitor hits, attract traffic through submitting URLs, META tags, news releases, banner ads, and reciprocal links">.

- It is important to resubmit a web page after major changes have been implemented. By resubmitting the page, search engines and directories have the opportunity to index your new page. The new index may significantly impact your search engine results ranking or place the page in another category. Resubmitting a website after significant changes have been made is one way to ensure that your site's content is current within the various search engines and directories.

[Note: The following websites have excellent information on the subject of web marketing via search engines, meta tags, etc. -- searchenginewatch.com, searchengines.com and http://home.eol.ca/~lillyb]

Reciprocal linking and cross promotion -- if you provide a link to my site, I will provide a link to your site -- is another way to increase traffic to your site. This takes full advantage of the way the web works. It is well known that word of mouth is a powerful form of advertising. With the web, verbal referrals are replaced with links or click referrals. A recent study by Forrester showed that 90 percent of satisfied online customers are likely to visit again, and that 87 percent will tell friends and family about the site.

Affiliate programs are becoming an extremely good way to generate traffic and revenue. An affiliate program works like this: You sign up to become an affiliate of a company (for example, amazon.com) on the web. Once you become an affiliate and provide a link to their site, any time someone visits them via your link and makes a purchase, you receive a percentage of the sale. It costs you nothing to do this, and you can use an affiliate program to promote your own site. You would give affiliates a percentage of sales they generate by linking customers to you. Tracking is crucial to affiliate programs, and you would have to incorporate such a system into the design of your site if you go with this type of program.

Advertisements are another way to increase traffic and to generate revenue. You can purchase ad space on sites that receive a lot of traffic, hoping to capture potential customers to your site, or you can sell ad space on your site to others. Don't forget to include your URL or web address

with your traditional forms of advertising and on all collateral business material such as radio, television, print, business cards, brochures, stationary, fax cover sheets, invoices, quotes, etc. www.yourname.com should be highly visible in all aspects of your business. Including your Web address on all business material allows you to expose current and potential customers to your address. The key is to get your Web address in front of as many people as possible.

The Bottom Line

The bottom line in business is, of course, profit -- and profit from e-tail is achieved by:

- getting customers to come to your site,
- getting customers to make a purchase once they get to your site, and
- getting customers to return to your site and purchase again, and again, and again!

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[13] StatMarket - www.statmarket.com

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Marketing's Four P's: First Steps for New Entrepreneurs

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EXPERT REVIEWED

Marketing your business is about how you position it to satisfy your market's needs. There are four critical elements in marketing your products and business. They are the four P's of marketing.

1. **Product.** The right product to satisfy the needs of your target customer.
2. **Price.** The right product offered at the right price.
3. **Place.** The right product at the right price available in the right place to be bought by customers.
4. **Promotion.** Informing potential customers of the availability of the product, its price and its place.

Each of the four P's is a variable you control in creating the marketing mix that will attract customers to your business. Your marketing mix should be something you pay careful attention to because the success of your business depends on it. As a business manager, you determine how to use these variables to achieve your profit potential. This publication introduces the four P's of marketing and includes worksheets that will help you determine the most effective marketing mix for your business.

Audience: Business managers

Content: Presents the four elements of marketing your products and business

Outcome: Readers will be aware of the range of marketing decisions they need to make

Product

"Product" refers to the goods and services you offer to your customers. Apart from the physical product itself, there are elements associated with your product that customers may be attracted to, such as the way it is packaged. Other product attributes include quality, features, options, services, warranties, and brand name. Thus, you might think of what you offer as a bundle of goods and services. Your product's appearance, function, and support make up what the customer is actually buying. Successful managers pay close attention to the needs their product bundles address for customers.

Your product bundle should meet the needs of a particular target market. For example, a luxury product should create just the right image for "customers who have everything," while many basic products must be positioned for price-conscious consumers. Other important aspects of product may include an appropriate product range, design, warranties, or a brand name.

Customer research is a key element in building an effective marketing mix. Your knowledge of your target market and your competitors will allow you to offer a product that will appeal to customers and avoid costly mistakes.

If you are considering starting a new business or adding a new product, then make sure the product bundle will fit your business's strengths and weaknesses, and that it will provide an acceptable risk/return tradeoff. For instance, if your business is very good at timely response to customers, then timely service should be an important part of your product bundle.

Think long term about your venture by planning for the ways you can deepen and broaden your product bundle. For instance, you may be able to take advantage of opportunities to add value through processing, packaging, and customer service. Other future growth may allow you to offer your product to different customers. Start-up businesses are most successful when they concentrate their efforts on one product or one market, like a restaurant or a car service center does. Later growth may occur in the same location or may be in different geographic regions.

A different type of growth would be a diversification of products, with your business offering related products. Offering a whole range of products is most successful if the raw materials, production processes, and distribution methods are similar, which means you do not have to acquire new suppliers, skills and equipment, and distribution methods.

Price

"Price" refers to how much you charge for your product or service. Determining your product's price can be tricky and even frightening. Many small business owners feel they must absolutely have the lowest price around. So they begin their business by creating an impression of bargain pricing. However, this may be a signal of low quality and not part of the image you want to portray. Your pricing approach should reflect the appropriate positioning of your product in the market and result in a price that covers your cost per item and includes a profit margin. The result should neither be greedy nor timid. The former will price you out of the market; pricing too low will make it impossible to grow.

As a manager, you can follow a number of alternative pricing strategies. In the next column are eight common pricing strategies. Some price decisions may involve complex calculation methods, while others are intuitive judgments. Your selection of a pricing strategy should be based on your product, customer demand, the competitive environment, and the other products you will offer.

- **Cost-plus:** Adds a standard percentage of profit above the cost of producing a product. Accurately assessing fixed and variable costs is an important part of this pricing method.
- **Value-based:** Based on the buyer's perception of value (rather than on your costs). The buyer's perception depends on all aspects of the product, including non-price factors such as quality, healthfulness, and prestige.
- **Competitive:** Based on prices charged by competing firms for competing products. This pricing structure is relatively simple to follow because you maintain your price relative to your competitors' prices. In some cases, you can directly observe your competitors' prices and respond to any price changes. In other cases, customers will select vendors based on bids submitted simultaneously. In those cases, gathering information will be more difficult.
- **Going-rate:** A price charged that is the common or going-rate in the marketplace. Going-rate pricing is common in markets where most firms have little or no control over the market price.
- **Skimming:** Involves the introduction of a product at a high price for affluent consumers. Later, the price is decreased as the market becomes saturated.
- **Discount:** Based on a reduction in the advertised price. A coupon is an example of a discounted price.
- **Loss-leader:** Based on selling at a price lower than the cost of production to attract customers to the store to buy other products.
- **Psychological:** Based on a price that looks better, for example, $4.99 per pound instead of $5.00 per pound.

After you decide on your pricing strategy, the amount of money you will actually receive may be complicated by other pricing aspects that will decrease (or increase) the actual amount of money you receive. You will also have to decide how to determine:

- **Payment period:** Length of time before payment is received.
- **Allowance:** Price reductions given when a retailer

agrees to undertake some promotional activity for you, such as maintaining an in-store display.

- **Seasonal allowances:** Reductions given when an order is placed during seasons that typically have low sales volumes to entice customers to buy during slow times.
- **Bundling of products/services:** Offering an array of products together.
- **Trade discounts** (also called "functional discounts"): Payments to distribution channel members for performing some function such as warehousing and shelf stocking.
- **Price flexibility:** Ability of salesperson or reseller to modify price.
- **Price differences among target customer groups:** Pricing variance among target markets.
- **Price differences among geographic areas:** Pricing variance among geographic regions.
- **Volume discounts and wholesale pricing:** Price reductions given for large purchases.
- **Cash and early payment discounts:** Policies to speed payment and thereby provide liquidity.
- **Credit terms:** Policies that allow customers to pay for products at a later date.

The methods discussed here should be a base from which to construct your price. Your options will vary depending on how you choose to sell your product. For instance, if you make a product but don't sell it directly to the customer, then you will want to know who sets the retail price and what margin they will require. Tracing the path of your product from production to final purchase is a useful exercise to discover this information. The research needed to understand the pricing along the distribution path will be more than worth the time it takes.

Whatever your price may be, ultimately it must cover your costs, contribute to your image by communicating the perceived value of your product, counter the competition's offer, and avoid deadly price wars. Remember, price is the one "P" that generates revenue, while the other three "P's" incur costs. Effective pricing is important to the success of your business.

Place

"Place" refers to the distribution channels used to get your product to your customers. What your product is will greatly influence how you distribute it. If, for example, you own a small retail store or offer a service to your local community, then you are at the end of the distribution chain, and so you will be supplying directly to the customer. Businesses that create or assemble a product will have two options: selling directly to consumers or selling to a vendor.

Direct Sales

As a producer, you must decide if supplying direct is appropriate for your product, whether it be sales through retail, door-to-door, mail order, e-commerce, on-site, or some other method. An advantage of direct sales would be the contact you gain by meeting customers face to face. With this contact you can easily detect market changes that occur and adapt to them. You also have complete control over your product range, how it is sold, and at what price.

Direct sales may be a good place to start when the supply of your product is limited or seasonal. For example, direct sales for many home-produced products can occur through home-based sales, markets, and stands.

However, direct sales require that you have an effective retail interface with your customers, which may be in person or electronic. If developing and maintaining this retail interface is not of interest to you or you are not good at it, you should consider selling through an intermediary.

Reseller Sales (Sales Through an Intermediary)

Instead of selling directly to the consumer, you may decide to sell through an intermediary such as a wholesaler or retailer who will resell your product. Doing this may provide you with a wider distribution than selling direct while decreasing the pressure of managing your own distribution system. Additionally, you may also reduce the storage space necessary for inventory. One of the most important reasons for selling through an intermediary is access to customers. In many situations, wholesalers and retailers have customer connections that would not be possible to obtain on your own.

However, in selling to a reseller you may lose contact with

your end consumer. In some cases, you may also lose some of your company identity. For example, your distributor may request that your product be sold under the reseller's brand name.

One factor that may influence whether you can find an intermediary to handle your product is production flow. Wholesalers want a steady year-round supply of product to distribute. If you can deliver a steady year-round supply that is of consistent quality, then selling through an intermediary may be a good strategy for you.

Market Coverage

No matter whether you sell your product direct or through a reseller, you must decide what your coverage will be in distributing your product. Will you pursue intensive, selective, or exclusive coverage?

Intensive distribution is widespread placement in as many places as possible, often at low prices. Large businesses often market on a nationwide level with this method. Convenience products—ones that consumers buy regularly and spend little time shopping for, like chewing gum—do better with intensive (widespread) distribution.

Selective distribution narrows distribution to a few businesses. Often, upscale products are sold through retailers that only sell high-quality products. With this option, it may be easier to establish relationships with customers. Products that people shop around for sell better with selective distribution.

Exclusive distribution restricts distribution to a single reseller. You may become the sole supplier to a reseller who, in turn, might sell only your product. You may be able to promote your product as prestigious with this method, though you might sacrifice sales volume. Specialty products tend to perform better with exclusive distribution.

Other Place Decisions

Product characteristics and your sales volumes will dictate what inventories to maintain and how best to transport your products. Additionally, the logistics associated with acquiring raw materials and ensuring that your final product is in the right place at the right time for the right customers can comprise a large percentage of your total costs and needs careful monitoring.

You may decide to have a combination of all the distribution methods. Whatever you decide, choose the method which you believe will work best for you.

Promotion

"Promotion" refers to the advertising and selling part of marketing. It is how you let people know what you've got for sale. The purpose of promotion is to get people to understand what your product is, what they can use it for, and why they should want it. You want the customers who are looking for a product to know that your product satisfies their needs.

To be effective, your promotional efforts should contain a clear message targeted to a specific audience reached via an appropriate channel. Your target audience will be the people who use or influence the purchase of your product. You should focus your market research efforts on identifying these individuals. Your message must be consistent with your overall marketing image, get your target audience's attention, and elicit the response you desire, whether it is to purchase your product or to form an opinion. The channel you select for your message will likely involve use of a few key marketing channels. Promotion may involve advertising, public relations, personal selling, and sales promotions.

A key channel is advertising. Advertising methods to promote your product or service include the following.

- **Radio:** Radio advertisements are relatively inexpensive ways to inform potential local customers about your business. Mid-to-late week is generally the best time to run your radio ad.
- **Television:** Television allows access to regional or national audiences, but may be more expensive than other options.
- **Print:** Direct mail and printed materials, including newspapers, consumer and trade magazines, flyers, and a logo, allow you to explain what, when, where, and why people should buy from you. You can send letters, fact sheets, contests, coupons, and brochures directly to new or old customers on local, regional, or national levels.
- **Electronic:** Company Web sites provide useful information to interested consumers and clients. Password-protected areas allow users to more

intimately interact with you. Advertisements allow broad promotion of your products. Direct e-mail contact is possible if you have collected detailed customer information.

- **Word of Mouth:** Word of mouth depends on satisfied customers (or dissatisfied customers) telling their acquaintances about the effectiveness of your products.
- **Generic:** Generic promotion occurs when no specific brand of product is promoted, but rather a whole industry is advertised. For instance, generic advertising is commonly found for milk, beef, and pork.

Public relations (PR) usually focuses on creating a favorable business image. Important components of a good public relations program include being a good neighbor, being involved in the community, and providing open house days. News stories, often initiated through press releases, can be good sources of publicity.

Personal selling focuses on the role of a salesperson in your communication plans. Salespeople can tailor communication to customers and are very important in building relationships. While personal selling is an important tool, it is costly. So you should make efforts to target personal selling carefully.

Sales promotions are special offerings designed to encourage purchases. Promotions might include free samples, coupons, contests, incentives, loyalty programs, prizes, and rebates. Other programs might focus on educating customers through seminars or reaching them through trade shows. Your target audience may be more receptive to one method than another. Additional sources of promotion may be attending or participating in trade shows, setting up displays at public events, and networking socially at civic and business organizations.

Final Comment

The four P's—product, price, place, and promotion—should work together in your marketing mix. Often, decisions on one element will influence the choices available in others. Selecting an effective mix for your market will take time and effort, but these will pay off as you satisfy customers and create a profitable business. The worksheets that follow will help you construct your marketing plans.

Once you have a good marketing mix—the right product at the right price, offered in the right place and promoted in the right way—you will need to continue to stay on top of market changes and adopt your marketing mix as necessary. Marketing is a part of your venture that will never end.

Four P's Worksheets

The following set of worksheets will help you understand and tailor your marketing mix to your customers' needs. The four sections relate to the four P's of product, price, place, and promotion. In the first part of each section, you will complete a table to help you gain a better understanding of what you are offering and what your competitors are offering. In the "Further Assessment" part of each section, you will answer questions to help you tailor your marketing mix to your customers' needs.

Product

Describe your product's characteristics in the first column and the characteristics of your competitors' product in the second column.

	Your Product	Your Competitors' Product
Product (e.g., fresh fruit beverage)		
Product Variety		
Product Appearance		
Product Quality		
Product Features		
Product Functionality		
Services		
Brand Name		
Packaging		
Warranties		

Further Assessment

1. What features are considered basic features by your customers (ones that must be offered)?	
2. What features are missing from the existing product/service choices in the market place? How can your product/service address this gap?	
3. What are the key features/benefits of your product and service, especially as they compare to what your competitors are supplying?	
4. How can your product give you an advantage in the marketplace?	

Price

For each of the following pricing strategies, describe the advantages and disadvantages of using that method for your product. Which is the best one for you to use?

	Advantages and Disadvantages for Your Product
Cost-Plus	
Value-Based	
Competitive	
Going-Rate	
Skimming	
Discount	
Loss-Leader	
Psychological	

For each of the following pricing aspects, describe the advantages and disadvantages for your product in the first column. In the second column, describe to what extent your competitors are following that approach.

	Advantages and Disadvantages for Your Product	To What Extent Are Your Competitors Using This Policy for Their Products?
Payment Period		
Allowance		
Seasonal Allowances		
Bundling of Products/Services		
Trade Discounts		
Price Flexibility		
Price Differences Among Target Customer Groups		
Price Differences Among Geographic Areas		
Volume Discounts and Wholesale Pricing		
Cash and Early Payment Discounts		
Credit Terms		

Further Assessment

1. How sensitive is your target market to changes in prices?	
2. How does your expected pricing compare to your competition's pricing?	
3. Will pricing make your business special?	
4. How will your products/services provide a better price-performance balance than your competitors' products/services?	

Place

In the first column, describe how your product is distributed. Describe your competitors' product distribution in the second column.

	Your Product	Your Competitors' Product
Direct Sales		
Reseller Sales		
Market Coverage		
Inventory		
Transportation		
Logistics		

Further Assessment

1. What is the best way to sell your product? Direct selling? Through a reseller? Will this be a competitive advantage or disadvantage?	
2. How will your plan for coverage and other place decisions compare to those of your competitors? Will this be a competitive advantage or disadvantage?	

Promotion

Describe your product's promotion in the first column and your competitors' promotion in the second.

	Your Product	Your Competitors' Product
Advertising		
Radio		
Television		
Print		
Electronic		
Word of Mouth		
Generic		
Public Relations		
Personal Selling		
Sales Promotion		

Further Assessment

1. What promotion efforts are most effective for your target market?	
2. How can your promotion strategy give you an advantage in the marketplace?	

Notes

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Communities on Course
Land Use

Private Property: Rights, Responsibilities, & Limitations

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Property rights are a concern for many landowners and are on legislators' agendas even more now than in the past. In particular, property rights in land prompt much thought and debate in today's political climate. Many property rights issues arise in the context of agriculture. This publication addresses frequently asked questions about property rights in land in order to dispel myths and misunderstandings, and generate thoughtful discussion.

I can do whatever I choose with my land, right?

Yes—within limits. Ownership of land extends from the sky to the lowest depths of the earth. The law holds property ownership in very high regard. Although landowners generally may do what they please with their land, there are limits on absolute ownership. Landowners are prohibited from using their property in a fashion that may injure their neighbors.

Property rights in land are often described by being compared to a bundle of sticks. Each stick represents a right. Each stick may be separated from the rest of the bundle. For instance, a landowner may rent his land to one person to farm and transfer the underground mineral rights to another entity. The landowner in this situation still holds other sticks in the bundle (like the right to sell the land), though a sale may be subject to rights extended to others.

In all circumstances, government agencies at the local, state, and federal level hold other rights, like the right to tax. Some sticks in your neighbor's bundle, like the right to use her property in a beneficial fashion, for example, may also affect your property.

How do you determine which land uses "injure" the neighbors?

Just as a property owner possesses rights to use his property, he also holds rights to prevent others from using their land in a manner that harms him or his property. "Nuisance" describes a situation in which one landowner is using his property in a way that unreasonably limits the use of his neighbor's land.

A "private nuisance" interferes with a relatively small number of people in their use of land. For example, if one neighbor plays her radio very loudly, especially during times that others sleep, that may constitute a private nuisance.

A "public nuisance" causes distress to a large number of persons (an entire neighborhood or community) in the use of their land. For example, a cement factory, which discharges large amounts of smoke and dust, may amount to a public nuisance.

Who decides whether a particular activity is a nuisance?

The first step in deciding whether a landowner is injuring his neighbor is a complaint by the neighbor. Property rights depend in large part on whether persons are being good neighbors. The preferred way to resolve property rights disputes is to talk to your neighbor *before* you engage in an activity that may be offensive. If neighbors cannot agree, the offended neighbor may file a nuisance lawsuit. Then, a court will decide the issue.

How does a court decide whether an activity is a nuisance or not?

In determining whether one landowner's use of land is an "unreasonable" interference of another property owner's use of land, the court must weigh many factors. On the one hand, the court must consider the extent of the harm, the character of the harm, the type of use being interfered with, and whether the use interfered with is appropriate to the area. On the other hand, the court must consider the benefits (income to the landowner, jobs, and tax revenue) provided by the offending use, whether the harm can be avoided with the continuation of the activity, and whether the offending use is suitable in that area. Courts balance these factors and consider other factors to resolve an issue.

What can courts do if they find a nuisance?

If a nuisance exists, the court has options in deciding what to do. The remedies may include money damages and/or an injunction. Money damages compensate the landowner for the interference with the use of his property. If the court orders the offending activity stopped, then the damages may be only for past injury. If the court allows the activity to continue, the damages may cover past and/or future injury.

An injunction is an order from a judge to stop an activity or a command that a certain action may begin or continue. In the nuisance context, the judge most often orders the landowner to cease the nuisance activity. However, courts may combine damages and a partial injunction. A partial injunction would order the landowner to cut back the offending activity to a certain level. For example, if a judge found that a large hog operation was a nuisance, the judge may limit the farmer to a smaller number of hogs.

The law allows judges great flexibility in fashioning creative remedies. In an Arizona case, the judge ordered a large cattle feedlot to move, but made the developer of the adjoining residential subdivision pay for the move—because the feedlot was there first. The solution to a nuisance case may involve a balancing process to be fair, similar to the balancing used to determine whether a nuisance exists.

Do zoning regulations affect property rights?

Yes. The United States Constitution and court cases give government entities the power to pass laws to protect the health, safety, welfare, and morals of their citizens. This power is called the "police power." Indiana and other states delegate this power, as it relates to land use, to local government units like cities and counties. With respect to land use, most local governments exercise their police powers through zoning ordinances. Zoning restrictions are intended to protect the health, safety, welfare, and morals of citizens.

Typical zoning ordinances divide the locality into districts. Within each district certain land uses are allowed, and certain other land uses are prohibited. The aim of typical zoning ordinances is to separate land uses. For example, all single family houses would be together and not beside a cement factory. Zoning laws are intended to avoid nuisances by prohibiting land activities that are potentially offensive to others. The United States Supreme Court has ruled that zoning ordinances may be valid exercises of the police power of state and local governments.

Can zoning prohibit me from putting a trailer on my property in which my elderly parents will live?

Yes. Zoning may prohibit using property in the way in which you want or in the way that may be most profitable to you. The standard a court usually applies to determine whether zoning prohibitions are appropriate is the "arbitrary and capricious" standard. In other words, when local governments are acting to protect the health, safety, welfare, and morals of their citizens, the courts allow them broad discretion.

A court will usually overturn the local government's zoning decision (for example, the denial of a request for a variance) if the decision is unreasonable and not supported by any facts. A court will not interfere with a land-use plan simply because a landowner has identified a more profitable use than is permitted by the plan.

Courts will also determine whether a zoning ordinance is for the public good, rather than for private gain. If the ordinance is for private gain, it is not valid. Again, one must look not only at a landowner's property rights, but how the exercise of those property rights will affect neighbors and the community at large. Property ownership entails not only private rights, but also obligations to the public.

What if the government takes some of my land to build a road or other government facility?

Federal, state, and local government agencies possess the power of eminent domain. An Indiana statute says private utilities may also possess the power of eminent domain for projects that benefit the public. Eminent domain pertains to the power of empowered agencies to acquire rights in private property to use for public purposes, even if the owner does not wish to sell. The Fifth Amendment of the United States Constitution provides that " . . . private property [shall not] be taken for public use, without just compensation."

Indiana's and other state's constitutions contain similar provisions. Any agency seeking to acquire private property rights for public use must follow steps in the law. Property owners may take action to insure fair compensation, or perhaps avoid the taking of their property in selected cases. Contact your lawyer or Purdue Extension for more information on eminent domain, condemnation, and property rights.

The property owner must be paid a fair price. If the owner and the agency cannot agree on a price, then a procedure exists for the court to set the price, usually after testimony from professional appraisers and due consideration to both sides. Therefore, the government and other entities serving the public good may infringe on private property rights under legal procedures. The agency must pay an acceptable or objectively determined price.

Does the government have to pay when a regulation or law reduces the value of my property?

Local, state, and federal governments may regulate land and land uses. Most members of society recognize this legal fact. However, just as the law places limits on the ability of landowners to use their land as they please, legal constraints exist on a government's ability to regulate land. The question may well be framed as "How far is too far?" In other words, how much may a government regulation reduce the value of a particular piece of private property before a "taking" occurs? When a government goes "too far" in regulating private property, it must pay just compensation.

The courts have struggled to define the point where governments have gone "too far" in regulating property. If the regulation is not for a "public purpose," the government must pay compensation. A regulation may not exist only to further private interest. Further, the requirements imposed by the regulation must be directly connected to the public purpose. Only on rare occasions does a taking result from lack of public purpose.

Two other situations automatically merit compensation for the landowner. First, when the regulation acts to physically invade private property, such as requiring a landowner to allow cable television wires on the landowner's property, compensation must be paid. Any type of physical invasion, regardless of how small, warrants compensation.

Second, when the regulation makes a piece of property "worthless," compensation must be paid. "Worthless" in this context means no profitable uses exist after the regulation. A significant reduction in value may not entitle the landowner to automatic compensation.

If the regulatory taking does not fall into one of the categories mentioned above, a court considers the following factors to determine whether an unlawful taking has occurred:

(1) the economic impact of the regulation on the landowner;
(2) the landowner's investment backed expectations; and
(3) the character of the government activity.

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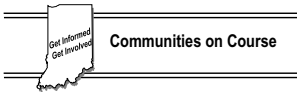

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No hard-and-fast rules exist to guide either the court or landowners in applying these factors. However, two examples may help illustrate the concepts involved.

First, suppose that the state government passes a law to protect wetlands. The law prohibits anyone from building, farming, or conducting any other activity on a wetland or within 1,000 feet of a wetland. Suppose you own a piece of land that is primarily wetlands. After this law is passed you cannot put a building anywhere on your land, farm the land, or do anything with your land. In this case, the law has made your land worthless and an unconstitutional taking has occurred. The government must pay you for your land.

Now consider a situation in which you own farmland in Indiana. First it is zoned to allow you to use the property for offices or commercial purposes. Then it is rezoned so that now you may only build single-family dwellings. The land still retains value, so you may not assume that a total taking has occurred. The value of the land is much less than prior to the rezoning, however. In a suit for compensation, the court would have to balance the three factors listed above. A court would likely determine that no taking has occurred in this situation.

Conclusion

The law regards property rights very highly and jealously guards their sanctity. Each landowner possesses the right to use his or her land in a reasonable manner. This right may be affected by a neighbor's use of his or her property. In these cases, where valid property rights of two or more persons exist, the respective property rights must be balanced to determine which right will prevail. A good neighbor policy of consulting with and giving advance notice to adjoining landowners can prevent many property rights disputes.

Similarly, the federal, local, and state governments may regulate land use. When there is a total or near total taking of one's property, the law provides for compensation at fair market value. A drastic reduction in the value of your land due to a new regulation does not automatically entitle a landowner to compensation. Property rights must be balanced against the needs, rights, and concerns of all parties involved.

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Zoning— What Does It Mean to Your Community?

Val Slack, Ag & Natural Resources Educator

Introduction

Indiana law does not require cities, towns, and counties to have a comprehensive plan or zoning. However, Indiana Code 36-7-4-600 series authorizes communities to institute zoning once a comprehensive plan has been approved and when they believe it is in the communities' best interest.

Zoning puts a community's comprehensive plan to work. A zoning ordinance has the force of the law, while a comprehensive plan does not. A zoning ordinance contains regulations to implement the comprehensive plan and includes rules on setbacks, signs, parking, landscaping, environmental restrictions, density, site plans, and more. Also included is a set of local regulations that spell out what a landowner can and cannot do with land and buildings. Land use regulations in a zoning ordinance encourage growth in some places and limit growth in other parts of a community.

What Is Zoning?

Zoning is the most common technique local governments use to influence the location and density of development. A zoning ordinance has two parts: a text and a map. The text describes the different land use zones, density standards, allowable and non-allowable uses, development standards, and the administration of the process. The map shows the location of the various zoning districts.

The ordinance is normally drafted by a community's planning commission or planning department. Once the draft is ready, a public hearing is held. Finally, the plan commission recommends it to the legislative body, which may reject, amend, or approve the ordinance.

Some communities have drafted or amended their zoning ordinances without referring to the comprehensive plan. Ignoring the comprehensive plan can render the zoning provisions invalid if they are challenged in court. The comprehensive plan, the zoning ordinance, and other land-use regulations must work together to achieve orderly growth.

What Kinds of Zoning Districts Are There?

There are four major types of zoning districts: agricultural, residential, business, and industrial. The types included in an area depend on the complexity of the township's or county's development.

Agricultural districts can be designated by the comprehensive plan or by the individual landowner. They allow agricultural activity as the principal use of the land. While agricultural production does not prohibit other uses, agricultural districts protect production agriculture from nuisance complaints and assessments for public use. Some ordinances require the land to meet minimum criteria to be eligible. Eligibility tests can include minimum production capabilities, minimum time to be designated in the district, and a minimum tract size requirement.

Residential districts may be established in several categories, depending on the type of development already established or anticipated. Factors that must be considered are density of population, existing and proposed streets and utilities, variety of housing types, and variety of housing-price groupings. Cluster development or planned unit development and conditional uses are some methods that provide flexibility in zoning regulations. Use distinctions often vary depending on desired density and code requirements.

Business districts include land zoned for commercial use. They should be

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based on need and not just on proximity to major thoroughfares. Zoning excessively large road frontages for commercial use permits strip development. Service streets, performance standards, and conditional uses are part of the development planning that can benefit business districts.

Industrial districts may or may not be needed, depending upon the location of the area to be zoned and its present mix of land uses. Having areas properly zoned for industry is an additional incentive for industrial expansions and new industry. By using the industrial zone, the community indicates that it wants to protect its industry from possible nuisance suits and is providing "protected" land for future growth. Communities can build flexibility into this type of zoning district by using performance standards for compatibility with non-industrial neighboring areas.

What Zoning Can & Can't Do in a Community

Zoning Can:

- assist economic growth by helping reserve adequate and desirable sites for industrial and commercial users.
- protect property from inconsistent or harmful use.
- protect individual property owners from harmful or undesirable uses of adjacent property.
- provide orderly and systematic transition in land use that benefit all land uses through public hearings and local decisions.
- help prevent objections to normal and necessary farming operations.
- make the community more attractive by assisting the preservation of open space, unique natural resources, and natural terrain features.
- inform residents where industry will be allowed to develop in an orderly fashion.
- protect a community's historic and architectural heritage.
- provide standards for population density and traffic circulation.

Zoning Cannot:

- change or correct land uses already in existence.
- prohibit farm buildings or interfere in farming decisions, such as crop or livestock selection.
- establish higher development standards than the community desires.
- guarantee that industrial, commercial, or tourism development will take place.
- assure that land uses will be permanently retained as assigned under the zoning resolution. (Rezoning is possible in response to changing conditions and unanticipated opportunities.)
- replace a building code.
- assure the proper administration of the zoning ordinance.

Conclusion

How well a zoning ordinance works depends upon beneficial public discussion and the decisions the planning commission, the zoning administrator, and the elected legislative officials make in responding to development proposals and proposed changes to the zoning text and map. These everyday decisions have far-reaching effects that can be felt for many years. Planners and plan commission members must work wisely to best meet future needs of residents.

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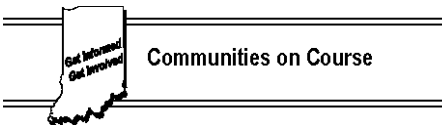

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NEW 4/00

What Is the Plan Commission & How Does It Work?

Val Slack, Ag & Natural Resources Educator

Introduction

The plan commission is in a unique position in local government. It is an independent commission made up of private citizens with neither legislative nor administrative authority. It is an advisor to a governing body. It also advises local governmental departments and officials, public agencies, private developers, and other individuals on matters related to the community's development.

The plan commission's position in the structure of local government greatly enhances its ability to carry out this advisory function. It is placed in the middle of the flow of information throughout the community. This central coordination function can be extremely valuable to the community and to its elected and appointed officials. Plans and proposals from individuals and groups who help develop the community pass through the plan commission.

What Is the Plan Commission?

The plan commission is a legally mandated group of people who draft a comprehensive plan, a zoning ordinance, and a subdivision ordinance. They also make recommendations to elected officials on proposed changes. Plan commissions have the authority to approve or deny subdivisions of land based on the subdivision control ordinance.

The planning legislation found in the Indiana Code encourages each city, town, and county in the state to create a plan commission. Once established, this body becomes the unit of local government with the responsibility for comprehensive planning and zoning.

The legislature carefully defined the responsibilities and duties of the plan commission. They are to create planning that is comprehensive, done on a continuing basis, and free from partisan pressures.

What Does the Plan Commission Do?

As the advisory arm of local government on planning issues, the plan commission has many important responsibilities. Some of the most common include the following.

1) Prepare and recommend to the legislative body a comprehensive plan for the physical development of the jurisdiction it serves and other tools useful for implementing the comprehensive plan.

2) Prepare and recommend zoning and subdivision control ordinances to the legislative body.

3) Review all petitions for amendments to the zoning ordinance and map, and recommend their approval or disapproval to the legislative body.

4) Review and approve or disapprove subdivision plats.

5) Do special studies as requested by the local legislative body.

6) Hold public hearings, as necessary, to receive comments from the public concerning changes to the plan, zoning ordinance, and other land use control regulations.

7) Review and revise the comprehensive plan, zoning ordinance, subdivision regulations, and capital improvement programs to keep them up to date and adjusted to changing conditions.

8) Carry on a continuing program for citizen education in planning and good public relations in the community.

9) Provide day-to-day advice and guidance to individuals regarding physical development, zoning, subdividing, and code regulations.

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What Happens at a Hearing?

The commission conducts many hearings for the purpose of considering subdivision applications and rezoning proposals. The hearings should be businesslike and fair to all parties concerned. Often there are three interests represented. There is the petitioner who proposes some kind of development, people representing the neighborhood interests who may want to support or oppose the development, and the commission itself, representing broad community interests. Here is a typical hearing procedure, including a suggested order of testimony.

A. Chairman opens meeting and reads agenda statement.

B. Oath to witnesses is administered.

C. Plan director reviews the protocol with the audience. Each speaker must be recognized by the chair before speaking, and each must state his or her name and address. The director also reviews the order of testimony. Here is a suggested order of testimony.

1. Persons wishing to speak pro or con are required to register.
2. Petitioner or representative appears before the plan commission to request change.
3. Secretary or plan director reads application and locates the area on the county map.
4. Plan director presents the staff report.
5. Petitioner presents evidence or facts relating to the case.
6. Chairman recognizes those who have registered who are in favor of the proposal.
7. Those in favor present evidence.
8. Chairman recognizes those who have registered who are against the proposal (remonstrators).
9. Remonstrators present their evidence.
10. Petitioners provide rebuttal.
11. Petitioner and remonstrator may be questioned by the commission members.
12. The chairman officially closes the public hearing on that petition.
13. Chairman calls for a motion.
14. Plan commission members discuss the motion.
15. Plan commission members vote.

D. Commission repeats this procedure for each petition.

E. After all advertised petitions have been heard, the commission may hear advisories or take care of other procedural business.

F. Meeting is adjourned.

What Are the Responsibilities of Plan Commission Members?

Plan commission members need to be prepared for the business to be discussed at the meetings. They should take time to review each proposal in light of the comprehensive plan and applicable land use control several days in advance. If a major development is involved, they can talk to the city or county engineer (or surveyor) or to others for a technical review. They should share any findings with other commission members.

Members should be prepared to act at the plan commission meetings. They should avoid spending so much time on the technicalities and procedural distractions that they miss the big issues. They should not vote on a request until they are satisfied that the proposal and its probable impact on the community are understood.

Effective plan commission members serve the public interest and are fair and unbiased. They conduct public business in public meetings, disclose any personal interests, and avoid abusing the power of public office. They should also attend meetings regularly, communicate openly, review staff reports, listen, give citizens a meaningful opportunity to participate, and seek solutions.

Conclusion

Plan commissions prepare communities for growth and change. Their review helps citizens have input and helps county governing boards make informed decisions. The impact of good planning may take some years to be recognized. An orderly growth pattern takes time as well as input from people who care about their community.

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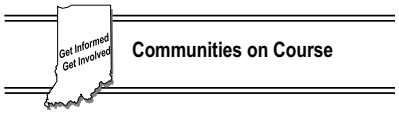

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Land Use

The Law Behind Planning & Zoning in Indiana

Jesse J. Richardson, Jr.
Urban Affairs and Planning
Virginia Tech

Julie O. Farris
Indiana Bar

Gerald A. Harrison
Agricultural Economics
Purdue University

Knowledge to Go
Purdue Extension

Introduction

Can the government restrict how you use your land? The answer, with some important qualifications, is "yes." Local governments may enact planning and zoning laws that restrict certain land uses within their jurisdictions. Planning and zoning laws are designed to promote the health, safety, and welfare of all of a locality's citizens by preventing incompatible land uses. They both restrict and protect landowners. For example, the government may enact a zoning ordinance that limits what you can build on your farmland, but it may also enact ordinances prohibiting others from constructing landfills or housing developments near your farmland.

To understand how planning and zoning may affect your land, it is important to be familiar with the legal terminology. This publication explains some of the basics of Indiana planning and zoning law, including its origins, general principles, and procedures. It also describes some limitations on the government's planning and zoning powers, and supplies a brief historical perspective.

The law regards municipalities as "creatures of the state" and dictates that municipalities must look to the state constitution, their charter, or state laws for authorization to exercise powers. Therefore, a municipality has only the zoning powers that the state gives it. Municipalities in Indiana include townships, cities, and counties.

Planning and zoning falls within the broad scope of the "police power." Even though the law accepts the general proposition that a locality possesses the power to plan and zone, the law places limits on that power.

The Police Power

Most purposes allowed to a municipality fall within the broad definition of the "police power." The term "police power" refers to the ability to legislate to protect the public health, safety, and welfare of the jurisdiction. The United States Constitution delegated this power to the states in the Tenth Amendment: "all powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people."

Thus, a broad grant of the police power to a locality does not give a locality the power to enact a zoning ordinance. The power to zone must be specifically delegated. The states have delegated portions of this police power to local governments by state constitution, charter, or enabling statute. The state grants charters to recognize the legal existence of the municipality, grant powers to the municipality, place limits on the powers of the municipality, and set out the boundaries of the entity.

One may think of a charter as the organizing document or "birth certificate" of the entity. A municipality does not exist until a charter is issued recognizing it.

Dillon's Rule

To deal with the issue of determining what powers a particular state has allocated to municipalities, several doctrines have emerged. The United States began with the proposition that municipalities are creatures of the state and must look to the state for all power. This doctrine was later stated as Dillon's Rule. The name derives from its primary author, a judge in Iowa. The rule dates to 1865 and says the following.

> It is a general and undisputed proposition of law that a municipal corporation possesses and can exercise the following powers and no others: First, those granted in express words; second, those necessarily or fairly implied in or incident to the powers expressly granted; third, those essential to the declared objects and purposes of the corporation—not simply convenient, but indispensable. Any reasonable doubt concerning the existence of a power is resolved by the courts against the corporation, and that power is denied.

This rule arose in response to widespread municipal corruption at the end of the 19th century. Courts felt that state control of local government power was necessary to combat crime boss rule of cities and other ills that were threatening democratic governance.

Home Rule

The home rule movement, beginning with Missouri in 1875, prompted several states to adopt state constitutional amendments expanding the scope of municipal independence. The home rule doctrine allows a municipality to exercise any function, so long as it is not prohibited by the state constitution or any state statute. Although the doctrine appears promising to those who want to expand local autonomy, one commentator characterized it as "an uncertain privilege, for it depends entirely upon the whim of the legislature and may at any time be repealed or modified." In addition, the grants of home rule authority vary widely. Some grants are very broad, while others are somewhat restricted.

By1978, 41 states had granted home rule authority to cities, while only 27 states had granted home rule jurisdiction to counties. Indiana adopted *legislative* home rule, whereby local governments may exercise all powers the state legislature is capable of delegating to them, even though the legislature has not delegated the power. The legislature may take certain powers from localities or limit local powers under legislative home rule. For example, if the Indiana legislature sets forth a certain manner in which a power may be exercised by a locality, the locality must follow the legislature's instructions.

In contrast, constitutional home rule refers to a grant of broad powers by the state constitution to local governments. The legislature cannot override such powers by statute because they are grounded in the constitution.

Home Rule in Indiana

Indiana statutes provide that "the policy of the state is to grant units all the powers they need for the effective operation of government as to local affairs." The Indiana Code explicitly rejects Dillon's Rule. A unit in Indiana may exercise any power to the extent that the power is neither expressly denied by the Indiana Constitution or Indiana statute nor expressly granted to another entity. A township may not exercise any power if a unit in which the township is located exercises that same power.

Indiana law provides that a unit must use the constitutionally or statutorily prescribed method of exercising any power, if the constitution or a statute provides a prescribed method. If no constitutionally or statutorily prescribed method exists, the unit must adopt an ordinance (county or municipality) or resolution (township) specifying the particular method of exercising the power or comply with any Indiana law permitting a specified manner for exercising the power.

A unit, through zoning, may not exercise authority more stringently in the case of a power granted to a state agency. An example is the confined feeding regulations. In fact, an Indiana law [IC 36-1-3-8 (7)] provides that a unit generally does not have power to

regulate conduct regulated by a state agency. Finally, the Indiana Code lists certain powers that units do not possess. These prohibited powers include unauthorized taxation and imposition of duties on other units.

Comprehensive Plans & Zoning

Indiana law requires that a plan commission adopt a comprehensive plan if the municipality wants to exercise zoning powers. A comprehensive plan must contain at a minimum:

1. A statement of objectives for the future development of the jurisdiction;
2. A statement of policy for the land use development of the jurisdiction; and
3. A statement of policy for the development of public ways, public places, public lands, public structures, and public utilities.

It is important to understand that comprehensive plans are not laws. Local plan commissions and legislatures must pay reasonable regard to comprehensive plans in making zoning decisions. However, courts generally do not entertain legal actions attacking comprehensive plans, unless the attack is directed at a failure to comply with the requirements set forth by the legislature. Comprehensive plans must be implemented by local ordinances. The most common implementation tool for comprehensive plans is the zoning ordinance.

Indiana law does not require localities to adopt zoning ordinances but allows the adoption at the option of the locality. If adopted, the zoning ordinance must contain the elements set out by the legislature in Indiana Code Section 36-7-4-600, et. seq.

Zoning is the division of a city or town by legislative regulation into districts and the prescription and application in each district of regulations having to do with structural and architectural designs of buildings and of regulations prescribing use to which buildings within designated districts may be put. New York City enacted the first comprehensive zoning ordinance in the United States in 1916. That ordinance classified uses and created zones for all uses. The zones were mapped. The provisions included height and area (setbacks, etc.) controls.

In 1926, the United States Supreme Court upheld the constitutionality of traditional comprehensive zoning ordinances in *Village of Euclid v. Ambler Realty Co.* [272 U.S. 365, 47 S. Ct. 114, 71 L. Ed. 303 (1926)]. Land use professionals refer to "traditional" zoning as "Euclidean" zoning. Euclidean zoning encompasses division of the municipality into geometric patterns of "use districts."

In other words, Euclidean zoning divides the area into sections. The ordinance restricts use of land within each section so that each section contains a single or narrow range of uses. For example, single-family residential zones contain primarily single-family houses. Farmland should predominate in agricultural zones. Note that all land in the jurisdiction zoned, for example, single-family residential, need not be, and usually is not, contiguous.

Historically, zoning seeks to prevent one landowner from harming his or her neighbor by engaging in an incompatible use. Zoning divides a city into uses (zones) in which harmful uses are excluded. By segregating uses, zoning attempts to separate incompatible uses.

But zoning serves purposes beyond preventing harm. Modern zoning often regulates uses to achieve public benefit or to maximize property values in a locality. Unfortunately, zoning may also be used to exclude low- to moderate-income people who cannot afford the housing permitted in the locality. This exclusion results, for example, from large minimum lot sizes or large minimum square footage requirements in residential districts. These requirements drive up the cost of housing.

Zoning laws embody the assumption that wholesome housing must be protected from harmful neighbors. Thus, commerce and industry are excluded from residential zones, because they are deemed harmful to housing. Even within residential zones, there is a

hierarchy of desirable uses. The law regards the single-family home as the highest use. Creation of districts containing only single-family homes seeks to protect this highest form of housing from intrusion by apartments, commercial development, or any other potentially interfering use.

Zoning Ordinance Categories of Uses

Zoning ordinances allow some uses in each district, prohibit others, and allow some uses only by special exception. This section examines and explains the various categories of land uses under each zoning ordinance.

Permitted Uses

Land use regulations specify for each zone those activities that are permitted as a manner "of right" or "permitted uses." If listed as a permitted use, the landowner may engage in this use without question.

Prohibited Uses

Generally, any use not listed as "permitted" is prohibited. An ordinance may specifically prohibit a particular use in a district to avoid a finding that this use may be similar to a permitted use in the district. For example, if not specifically prohibited, a court could find that a mobile home is a "single-family dwelling" allowable in a single-family residential district.

A board of zoning appeals may approve or disapprove a "variance." A variance allows a use that is prohibited by the zoning ordinance. The board may impose reasonable conditions as a part of its approval. In cases where variances are available**,** Indiana law prohibits a board of zoning appeals from approving a variance unless the board determines in writing that all of the following are true.

1. The approval will not be injurious to the public health, safety, morals, and general welfare of the community;
2. The use and value of the area adjacent to the property included in the variance will not be affected in a substantially adverse manner;
3. The need for the variance arises from some condition peculiar to the property involved;
4. The strict application of the terms of the zoning ordinance will constitute an unnecessary hardship if applied to the property for which the variance is sought; and
5. The approval does not interfere substantially with the comprehensive plan of the locality.

Special Exceptions

To conduct certain uses, a landowner may have to apply for and receive a "special exception." A special exception is a permit that allows a particular use subject to listed conditions. (Special exceptions are also referred to as special uses, conditional uses, or contingent uses that require a permit.)

The use of the word "exception" is misleading. Special exception uses are allowed in that particular district, but not in all locations within the district and not without conditions or qualifications.

For example, if listed as a special exception in the agricultural zone, an intensive livestock operation may be appropriate in those portions of an agricultural zone that are thinly populated and contain appropriate soils, topography, and tree buffers. However, in other areas of the zone that are adjacent to dense residential settlements or where the intensive livestock operation may threaten groundwater, the operation is not appropriate.

Permitted uses in a zoning ordinance are like or can be compared to the purchase of clothing "off the rack." Perhaps the use does not precisely "fit" each area within the zone. However, the governing body feels that the fit is close enough to warrant allowing the use throughout the zone.

In contrast, special exceptions are like tailored clothing. The governing body of the jurisdiction tailors the conditions and restrictions of the special exception to fit the particular piece of property on which the use will be conducted.

Amendment of the Zoning Ordinance

Once a zoning ordinance has been adopted and land has been zoned, problems may arise with proposed amendments to change the zoning application to specific parcels or to grant relief from its requirements to certain lots. Amendments to a zoning ordinance are commonly called "rezonings." Rezonings that apply to specific parcels or certain lots should be distinguished from comprehensive rezoning. Comprehensive rezoning involves study of the entire municipality and a reworking of the entire zoning ordinance. This section details the legal issues that arise when localities rezone all or a portion of the locality.

Rezonings Generally

Like the adoption of the original zoning ordinance, the amendment of a zoning ordinance is a legislative matter and must first be considered by the plan commission. As a legislative matter, the rezoning decision is left to the discretion of the local legislative body. The courts will reverse the rezoning decision of the locality only when it is arbitrary or capricious.

Arbitrary and capricious decisions involve willful and unreasonable action without consideration and in disregard of the facts or circumstances of the case. Courts examine individual or specific rezonings more closely than comprehensive rezonings because the chance for arbitrariness is heightened when only one or a few land parcels are involved.

Courts must pay reasonable regard to the comprehensive plan. Reasonable regard must be given to current conditions, structures, and uses in the district; the most desirable use of the land in the district; conservation of property value in the jurisdiction; and responsible growth and development (IC 36-7-4-603).

Spot Zoning

"Spot zoning" is perhaps the most used and least understood term in zoning parlance. Spot zoning is defined as the singling out of one piece of property for a different treatment from that accorded to similar surrounding land, which is indistinguishable from it in character, all for the economic benefit of the owner of the lot or area so singled out. In Indiana, spot zoning is not illegal per se if the zoning action bears a rational relation to the public health, safety, morals, convenience, or general welfare. The key distinction is that spot zoning is not pursuant to the police power when it fails to further the public interest. Instead, spot zoning provides private benefit, perhaps to the detriment of the public.

Agricultural Non-Conforming Use

"Grandfathered use" is synonymous with "non-conforming use." A non-conforming use is a use of the premises that legally existed prior to the enactment of a zoning ordinance or proper amendment of the zoning ordinance and which is permitted to continue subsequent to the enactment of the ordinance despite the fact that it does not conform to the new zoning requirements. However, since non-conforming uses deviate from the desired uses under the zoning ordinance, the law frowns upon them.

Typically, a zoning ordinance will allow continuance of a non-conforming use, but will prohibit extension, expansion, or change unless to a conforming use. In addition, most ordinances provide that if a non-conforming use is abandoned for two years or more, the use may not be reinstated. Some localities "amortize" the use, which requires a property owner to discontinue the non-conforming use after a certain period of time.

Indiana law now gives added protection to "agricultural non-conforming use." This law, which has attracted much attention, is shown in Appendix A. It was passed in1998 and amended in1999. "Agricultural use" for non-conforming use purposes is broadly defined. The essence of this new law is that zoning changes or a comprehensive plan may not terminate or restrict (e.g., amortize or limit extension) an agricultural use if it was consistent with or a permitted use under the prior zoning ordinances and was in place three of the five years before a recent change in zoning.

Conclusion

Planning and zoning by local governments carry out the police power function of protecting the general health, safety, and welfare of the citizens. The planning function is reflected in the comprehensive plan, which is implemented most commonly through zoning ordinances.

Zoning ordinances mainly attempt to prevent incompatible uses from locating next to one another. This is accomplished by separating uses in different zoning districts. Zoning itself is fairly straightforward. However, the law allows variances and some uses are permitted only under certain circumstances. In addition, uses that were permissible prior to the zoning ordinance or amendment are subject to restrictions. To understand the law behind planning and zoning, one must be familiar with the legal terminology.

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Appendix A

Indiana Law on Agricultural Non-Conforming Use (IC 36-7-4-616)

(a) The definitions used in this section apply only to this section.

(b) As used in this section, "agricultural use" refers to land that is used for:

(1) the production of livestock or livestock products, commercial aquaculture, equine or equine products, land designated as a conservation reserve plan, pastureland, poultry or poultry products, horticultural or nursery stock, fruit, vegetables, forage, grains, timber, trees, bees and apiary products, tobacco, or other agricultural crops, in the case of land that was not subject to a comprehensive plan or zoning ordinance before the most recent plan or zoning ordinance, including any amendments, was adopted; or

(2) agricultural purposes as defined in or consistent with a comprehensive plan or zoning ordinance that:

(A) the land was subject to; and

(B) was repealed before the adoption of the most recent comprehensive plan or zoning ordinance, including any amendments.

(c) As used in this section, "agricultural nonconforming use" means the agricultural use of land that is not permitted under the most recent comprehensive plan or zoning ordinance, including any amendments, for the area where the land is located.

(d) An agricultural use of land that constitutes an agricultural nonconforming use may be changed to another agricultural use of land without losing agricultural nonconforming use status.

(e) A county or municipality may not, through the county or municipality's zoning authority, do any of the following:

(1) Terminate an agricultural nonconforming use if the agricultural nonconforming use has been maintained for at least any three (3) year period in a five (5) year period.

(2) Restrict an agricultural nonconforming use.

(3) Require any of the following for the agricultural nonconforming use of the land:

(A) A variance for the land.

(B) A special exception for the land.

(C) A special use for the land.

(D) A contingent use for the land.

(E) A conditional use for the land.

(f) Notwithstanding subsection (e), this section does not prohibit a county, a municipality, or the state from requiring an agricultural nonconforming use to be maintained and operated in compliance with all:

(1) state environmental and state health laws and rules; and

(2) requirements to which conforming agricultural use land is subject under the county's comprehensive plan or zoning ordinance. As added by P.L.113-1998, SEC.1. Amended by P.L.106-1999, SEC.2.

2/2002

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WOODLAND MANAGEMENT

The Economics of Timber Stand Improvement

W. L. Mills, Jr. and Burnell C. Fischer

Silvicultural Goals

Timber stand improvement (TSI) is a conscious woodland management investment which encompasses a number of different silvicultural treatments. TSI includes improvement cutting, cleaning, weeding, and liberation cutting and thinning. In Indiana, the two major activities conducted under the term TSI are 1) improvement cuttings and 2) thinnings.

Improvement cuttings are generally made in previously unmanaged stands and take the form of removing cull trees or low-value species. The goal of such an operation is to increase future stand value by removing trees of little or no economic value and by providing space in which higher quality and high-value species can develop. Secondary goals may be removal of poor seed sources and vine control.

Thinnings to control density are the second major activity associated with TSI. The goal is to lower the density to an optimum level so that the growth potential is redistributed to the most desirable trees. In thinning, all the trees remaining are assumed to be left for a specific reason. An uncut tree may be left to become a crop tree, a trainer for a crop tree, or to act as a "spacer" in the stand.

Crop tree release is a special application of thinning. In this case, the trees to be removed are determined by proximity to preselected crop trees. Crop trees are selected on the basis of their quality or potential quality from species having above average market prices, such as black walnut, yellow poplar, and white oak. The purpose of this activity is to reduce the cost of thinning the whole stand while still gaining the benefits of increased growth on selected high-value trees. Occasionally, trees of lesser quality potential are selected as crop trees if they are members of the high-value species group. Release may save them from being suppressed and killed by dominating less-valuable trees which overtop them.

The goal of any TSI project is the concentration of diameter growth on high-value, vigorously growing trees. The degree to which this goal can be satisfied for any individual woodland will depend, in large part, on the stands' condition before TSI. Obviously, stands which need only small amounts of TSI are going to respond the least. Stands where the residual stand will be less than 35 to 50 percent of desirable trees might be more efficiently managed by a regeneration cut and possibly supplemental planting. Stands of intermediate quality will have the greatest potential for response from TSI when the desirable trees form 50 to 80 percent of the residual stocking.

Characteristics of the TSI Investment

Costs

The costs incurred in a TSI investment are:

- Paid professional services used in evaluating the woodlands
- Paid professional service used in the designation of trees to be saved or removed
- Expense of removing or killing trees designated for removal
- Capitalization of the investment over time.

The expense of removing or killing trees comprises the cost of labor and overhead, including supervision, supplies and equipment, insurance, and transportation. Capitalization is the implicit interest cost of holding an investment over time. It is the required rate of return necessary to maintain the funds in the investment. The investment analysis suggested herein calculates the capitalization (interest) costs, and it is not necessary to enter them explicitly. As the length of the investment period increases, the capitalization costs will increase as well.

Benefits

The economic benefits stemming from TSI are:

- Increased stand value through improved tree quality
- Faster diameter growth on the crop trees, which may reduce the investment period.

Increased stand value results from diameter growth being concentrated on higher-valued, faster-growing trees. Usually, overall tree quality will increase. Since the trees are growing faster, the investment period may be shortened, and the capitalization cost may be reduced. Together, this results in larger trees of higher quality, which means more volume per tree at higher per board foot prices.

The greatest single problem in the analysis of TSI is the estimation of the benefits. The anticipated benefits are difficult to quantify. Foresters familiar with local conditions can utilize their professional experience and judgement in making these estimates.

TSI Investment Analysis

The TSI investment analysis procedure presented here will determine if the cost of the investment is equal to or less than the benefit gained from the investment. Only those costs and benefits which are attributable to the TSI activity are pertinent. Past costs and revenues do not affect the analysis. *The benefit measured is the difference in future value between untreated and treated woodlands, not the difference between present stand value and future stand value of the treated stand.* This is an important consideration because it reduces the benefit which is sometimes erroneously attributed to TSI, the difference between present and future value of the treated stand.

Current prices are used to evaluate the worth of the timber to remove the influence of inflation. Since the value of the TSI operation is being examined and inclusion of the price changes will mask the true affect of TSI, current prices must be used in this analysis. This does not imply constant prices, since current price varies with quality.

Tax impacts on the TSI investment are complex. Depending on the degree of sophistication desired, the analysis can be done before or after taxes. The examples below are before taxes. To obtain an after tax analysis, the costs and benefits must be net of the tax imposed on them.[1]

The availability of federal cost sharing funds can also reduce the out-of-pocket cost to forest owners. This means that two analyses may be performed, one for the rate of return on the woodland owner's out-of-pocket costs, and one for the total cost of the investment to evaluate the overall effectiveness of the cost sharing program.

A Step By Step Procedure For Analyzing TSI Investments

STEP 1 Obtain an inventory of present stand conditions. This includes the percentage of cull and other undesirable trees by volume basal area and/or number of trees, total merchantable volume, a measure of stocking level of desirable trees, and projected growth.

STEP 2 Using the projected growth, calculate[2] the future stand condition including all the above stand parameters. To the volume information, apply current prices to determine the future value of the stand with TSI.

STEP 3 Using the above calculated growth rate and anticipated increase in growth, estimate the future value of the stand if TSI is completed. The anticipated increases are crucial, and yet, there is little definitive information available. This is where an experienced professional forester is most valuable. With a knowledge of current published research and his knowledge of local condition, the forester can estimate the increased growth. Again using present prices, calculate the value of the future stand with TSI.

STEP 4 Calculate the net gain from the TSI by subtracting the value found in STEP 2 from the value found in STEP 3. If this net gain is negative, it is obvious that TSI will not pay. If the net gain is positive, go on to STEP 5.

STEP 5 In this step, three ways of assessing the rate of return on the TSI investment are described. It is first necessary to select the rate of return (interest rate) which you "demand" from an investment of this type. Then perform any one of the following.

Method A. In Appendix I select the graph which represents your chosen rate of return. Then find the dollar return on the Y axis, that is, the net gain calculated in STEP 4.

From that point, project a horizontal line across the graph until it reaches the length in years of the

[1] *A Guide to Federal Income Tax for Timber Owners.* Agricultural Handbook 596, USDA Forest Service. 1982. U.S. Government Printing Office. 74 pages.

[2] Stand growth projections can be made using a number of different methods. See Husch, B., C.I. Miller, and T.W. Beers. 1982. *Forest Mensuration,* 3rd Ed., New York, The Roland Press Company, Chapter 16 or Moser, J.W., Jr. 1972. *Purdue Forest Data Processing Service Program Documentation.* Purdue University Agricultural Experiment Station Research Bull. No. 891, 48p.

investment period. Now, interpolate between the various investment curves to estimate the maximum outlay which will yield the given return in the specified investment period. If the cost of TSI is less, accept the TSI project; if the cost is greater, reject TSI.

Method B. A second way to evaluate the investment is, again, by selecting the appropriate graph from Appendix 1. Find the number of years equaling the investment period on the X axis. Next, project a vertical line upward until it reaches the investment curve corresponding to your estimated cost of TSI. (Interpolation between investment curves will probably be required). From this point on the vertical line, project a line horizontally to the Y axis, and read the required dollar return. Compare this dollar return with the net gain of STEP 4. If the value from the graph exceeds the net gain, the TSI investment will not pay at that interest rate. If the dollar return for the graph is equal to or less than the net gain, the TSI investment is acceptable at that interest rate.

Method C. A third and more general method is to calculate an internal rate of return[3] directly using the following formula:

$$(1+i)^n = \frac{NG}{C} \quad \text{or} \quad i = \left(\sqrt[n]{\frac{NG}{C}}\right) - 1.$$

where i= internal rate of return
n= number of years in the investment period
NG= net gain calculated in STEP 4
C= total cost of TSI

In most situations, average per acre value should be used to enter the graphs in Appendix I, while total net gain and total cost can be used in method C.

SAMPLE ANALYSIS.

Even-aged Example[4]

Present Age - 40 years Site Index 75 (50 years)
Rotation Age - 65 years Investment Period 25 years

STEP 1 - Calculate present stand conditions per acre for all trees 2.6 inches DBH and greater.

Basal Area	101
Volume (BDFT Doyle, DBH - 8.5 inches)	731
Percent Cull	20
Number of trees	400
Average DBH	6.8
Age	40

STEP 2 - Estimate the future stand conditions per acre without TSI.

Basal Area	115
Volume	3845
Percent Cull	20
Number of trees	249
Average DBH	9.2
Age	65
Value ($160/M stumpage)	$492

STEP 3 - Estimate the future stand condition per acre with 20% TSI.

Basal Area	106
Volume	4021
Percent Cull	5
Number of trees	210
Average DBH	9.6
Age	65
Value ($180/M stumpage[5])	$724

STEP 4 - Calculate the net gain.

Net gain (NG) = Value estimated in STEP 3 Value estimated in STEP 2
NG = $724 - $492
NG = $232

STEP 5 - Using method C, calculate the internal rate of return.

$$(1+i)^n = \frac{NG}{C}$$

let C = $28
NG = 232
n = 25

$$(1+i)^{25} = \frac{232}{28}$$

$$i = \left(\sqrt[25]{\frac{232}{28}}\right) - 1$$

$i = 0.0888$ or 8.8%

If the required return on investment is greater than 8.8% reject the investment. If the required return on investment is less than 8.8% accept the investment.

Uneven-aged

The analysis of TSI in uneven-aged management is somewhat more complicated. This stems from the fact that each tree has a rotation length and, in theory, establishment costs and harvest revenues are occurring simultaneously. In practice, harvests normally occur at regular intervals in time, and the cost of TSI can be capitalized until the next harvest.

[3]Internal rate of return is the interest rate which equates the NG with the cost of the TSI operation, plus the capitalization costs.

[4]Data from Dale, Martin, 1972. *Growth and Yield Prediction Program for Upland Oak*, USDA Forest Service Research Paper NE - 241, 21p.

[5]Board foot value increase is due to overall quality increase and not a change in price due to inflation or other factors.

The benefits accruing to uneven-aged stands can be measured as described earlier; however, special consideration should be taken in evaluating the residual or growing stock's value. TSI should continually increase the value of this growing stock even if the same stand parameter, (i.e., basal area) limit is used in the management plan. Figure A displays this idea graphically. The upper graph simulates stand development while the lower graph simulates monetary value for the same stand, with and without TSI. Without forest management and continuous harvesting, it is likely that the value of the growing stock will decline rather than remain stable. Figure A assumes equal forest management practices except in the use of TSI. Some of the value of TSI in uneven-aged stands will be in this increase in value of the growing stock.

A word of caution concerning the relations depicted in Figure A. These relationships are based upon theory. There is very little empirical evidence showing whether or not these events will actually occur as depicted. Again, local knowledge should allow a forester to interpret these relationships for the landowner's situation.

Uneven aged Example [6]

Investment Period	15 years
Estimated Site Index	85
	(50 years, dominate oaks)

STEP 1 - Calculate present stand conditions per acre for all trees 11.0" DBH and larger.

Basal Area	64
Volume (BDFT, Doyle)	3712
Percent Cull	16
Number of trees	46
Average DBH	15.9

STEP 2- estimate future stand conditions per acre without TSI.

Basal Area	65
Volume	5212
Percent Cull	16
Number of trees	42
Average DBH	16.8
Value (assorted stumpage prices according to species)	$504

STEP 3 - Estimate future stand conditions with 16% TSI.

Basal Area	60
Volume	6019
Percent Cull	3
Number of trees	37
Average DBH	17.1
Value (determined as above)	$596

STEP 4 - Calculculate net gain.

Net gain = Value estimate in STEP 3 minus Value estimate in STEP 2

NG = $596 — $504

NG = $92

STEP 5 - Using method A, assume than an 8% return on investment is required. Find Figure 4, Appendix I. On the graph, find the point equal to $92 on the Y-axis. Next, project a line to the right across the graph, stopping at 15 years on the x-axis. This is shown on Figure B. Now, by interpolating between the investment cost curves of $20 and $30, a cost of $29 is estimated. This means that an investment of $29 in TSI will yield an 8% return on investment in 15 years. If the actual cost of TSI is below $29, the investment in TSI will be returning at least 8%, and the project is acceptable. If the TSI will cost more than $29, the rate of return on investment will be less than 8%, and the project should be rejected.

Conclusion

The paper suggests an investment analysis procedure for TSI, as well as discussing the motivation for use of TSI. No attempt was made to provide widespread prescriptions or recommendations for the use of TSI. The purpose was to encourage foresters and other woodland managers to consciously and objectively examine the economics of TSI. TSI, for the sake of TSI, is not a justifiable silvicultural operation. If all TSI investments are analyzed with only acceptable investments undertaken, TSI operations will result in improved returns to the woodland owners and an efficient allocation of resources for the production of timber.

[6]Data was taken from demonstration woods inventories, Department of Forestry and Natural Resources, Purdue University.

Figure A. Expected changes in an uneven-aged stand with and without TSI.

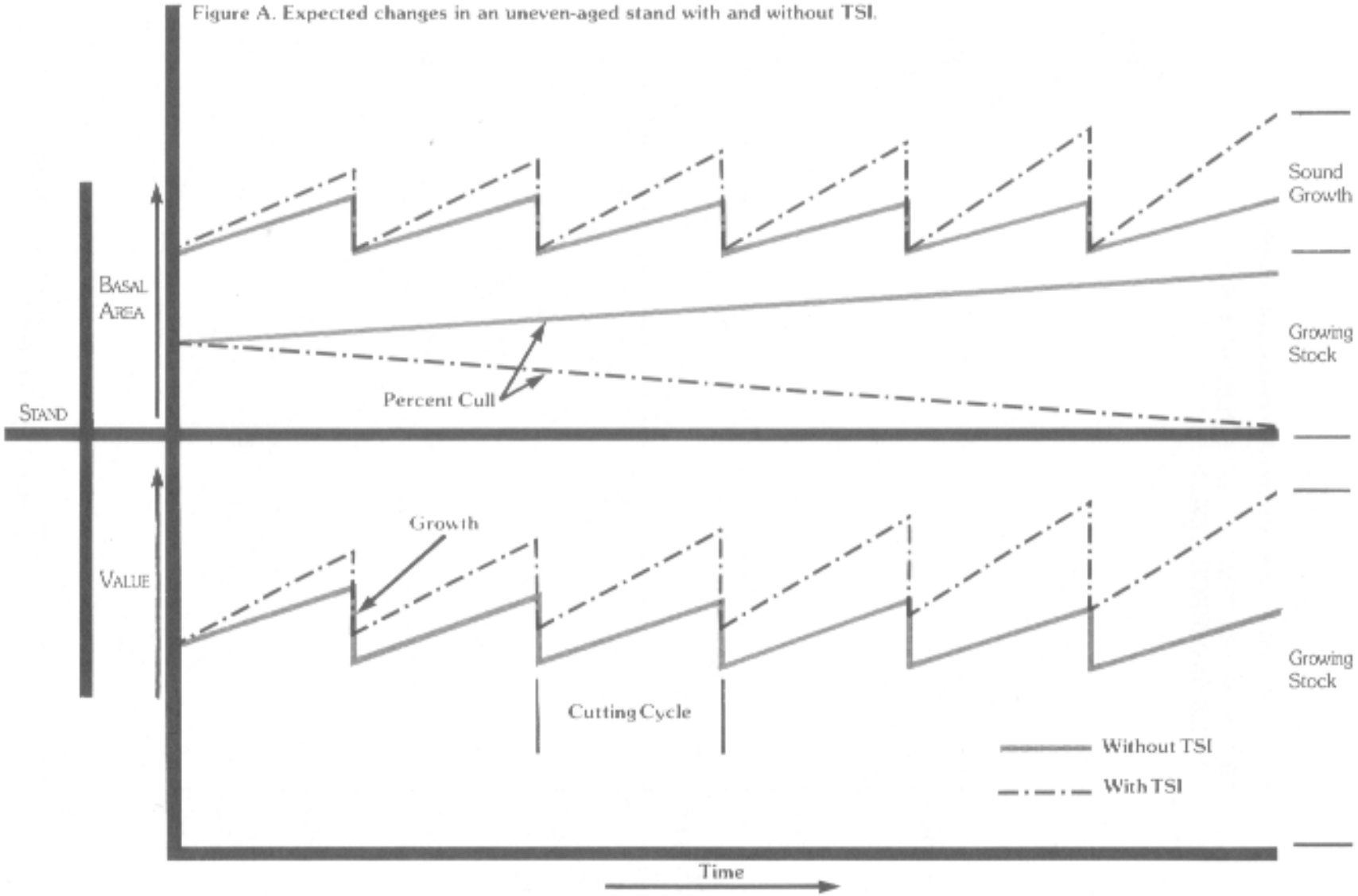


Figure B. Method A Using data from the uneven-aged example.

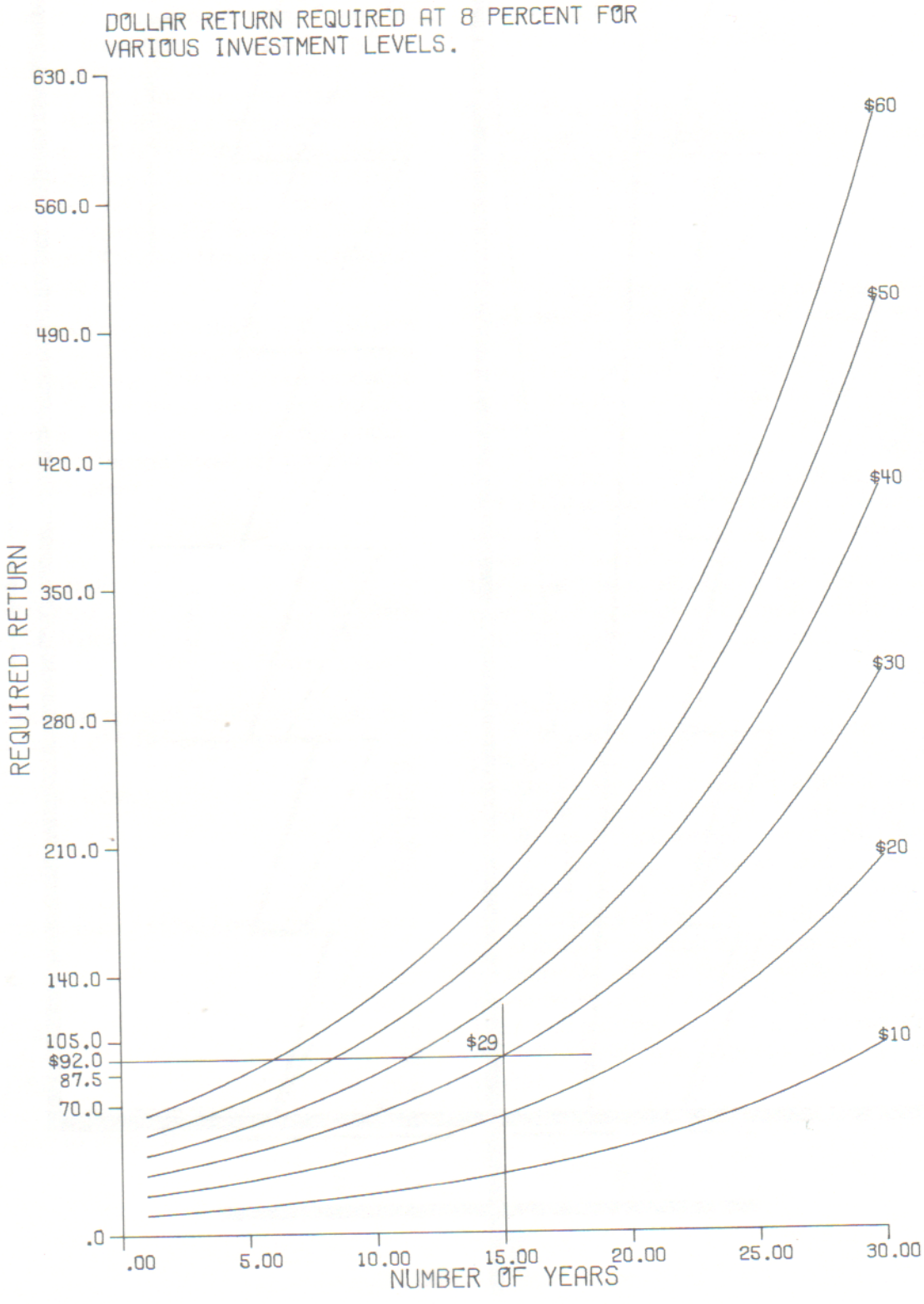


FIG.1 DOLLAR RETURN REQUIRED AT 5 PERCENT FOR VARIOUS INVESTMENT LEVELS.

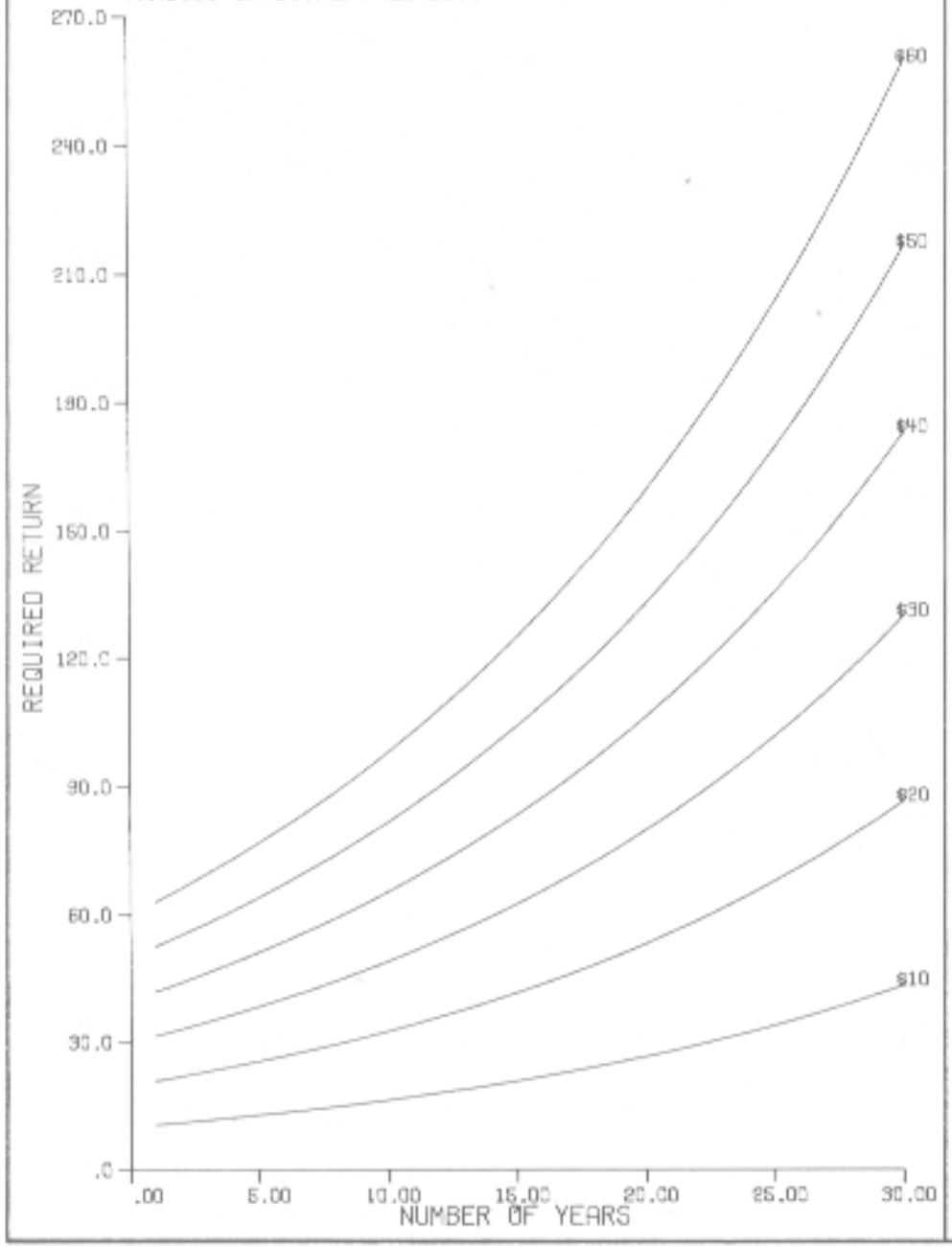


FIG.2 DOLLAR RETURN REQUIRED AT 6 PERCENT FOR VARIOUS INVESTMENT LEVELS.

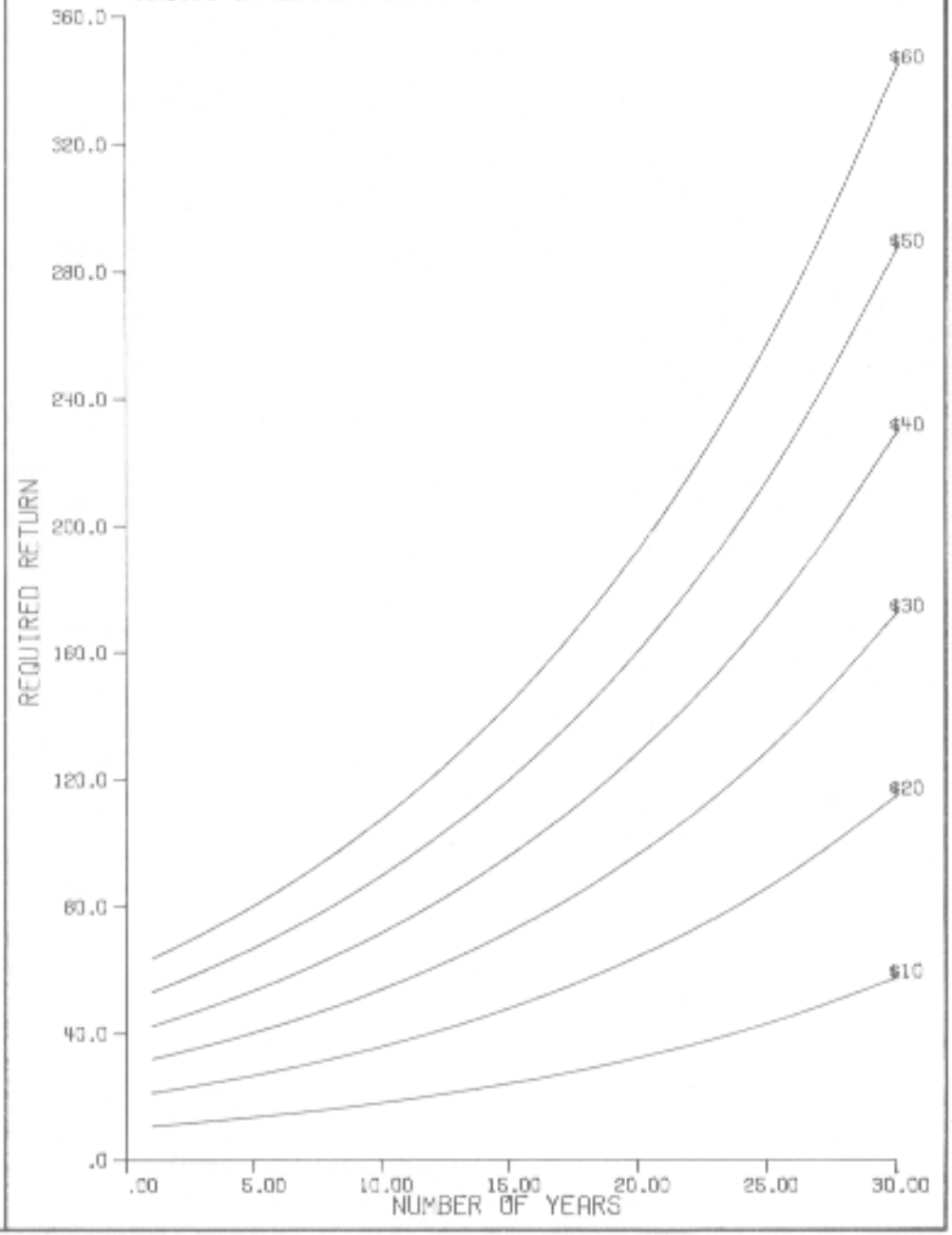


FIG.3 DOLLAR RETURN REQUIRED AT 7 PERCENT FOR VARIOUS INVESTMENT LEVELS.

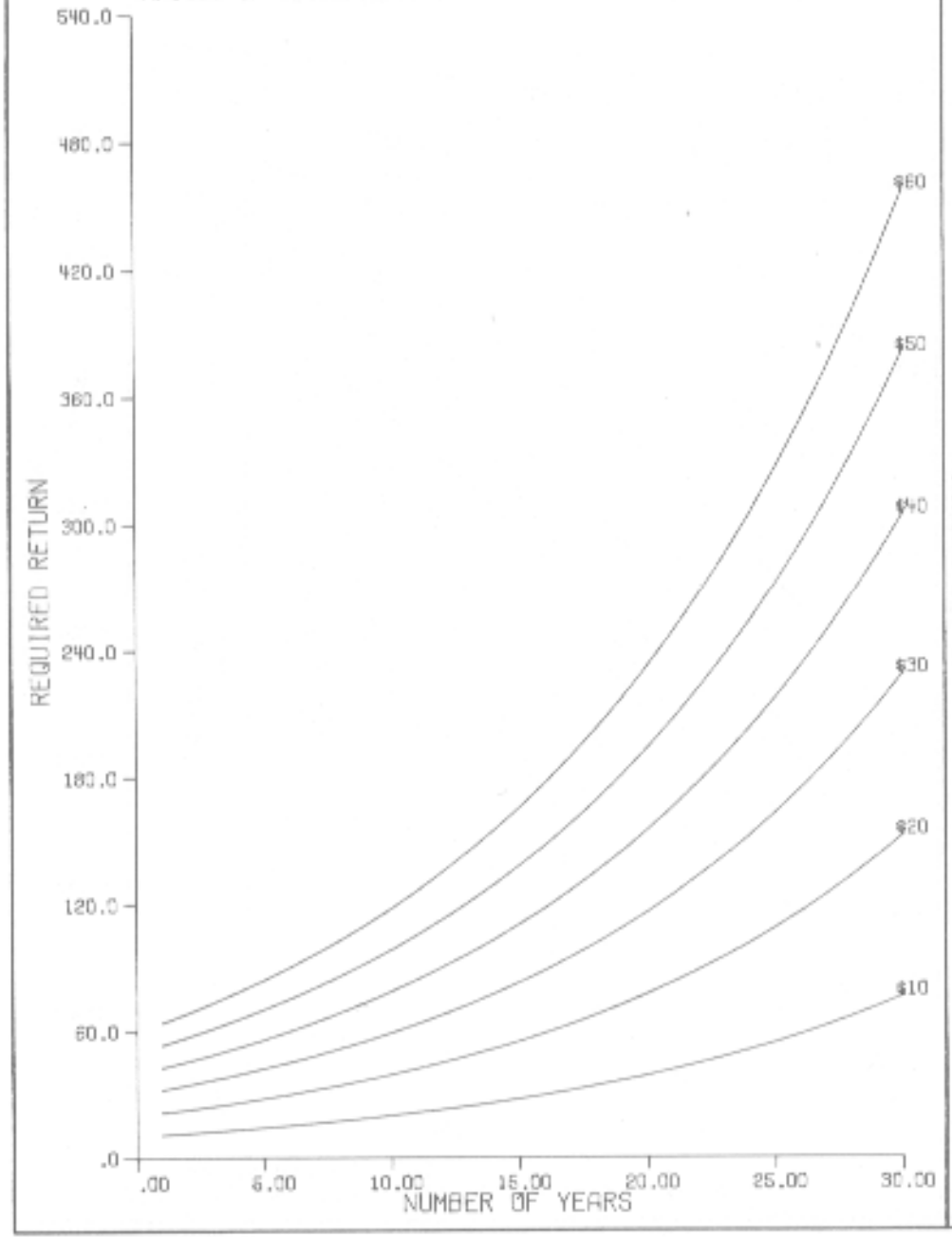


FIG.4 DOLLAR RETURN REQUIRED AT 8 PERCENT FOR VARIOUS INVESTMENT LEVELS.

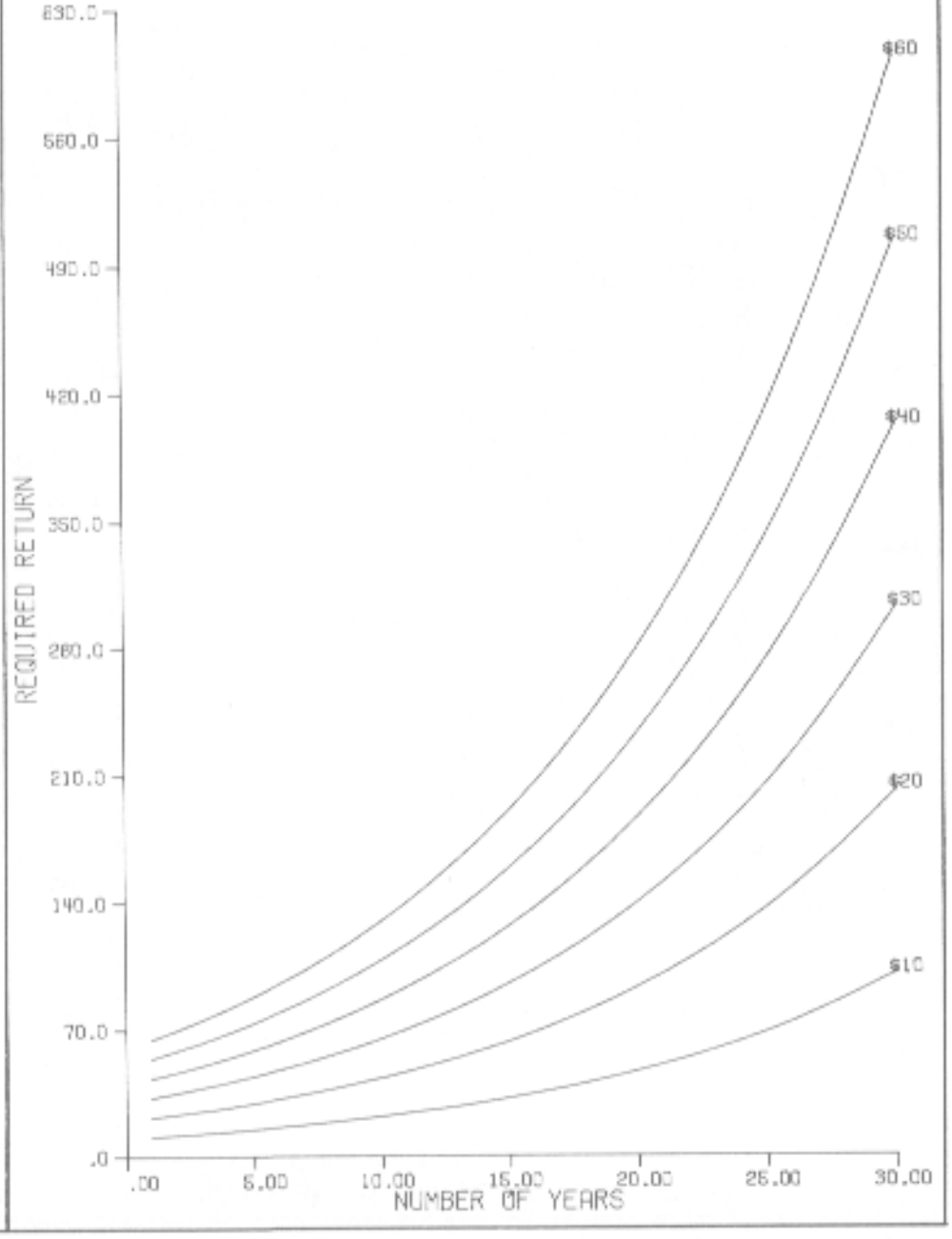


FIG.5 DOLLAR RETURN REQUIRED AT 9 PERCENT FOR VARIOUS INVESTMENT LEVELS.

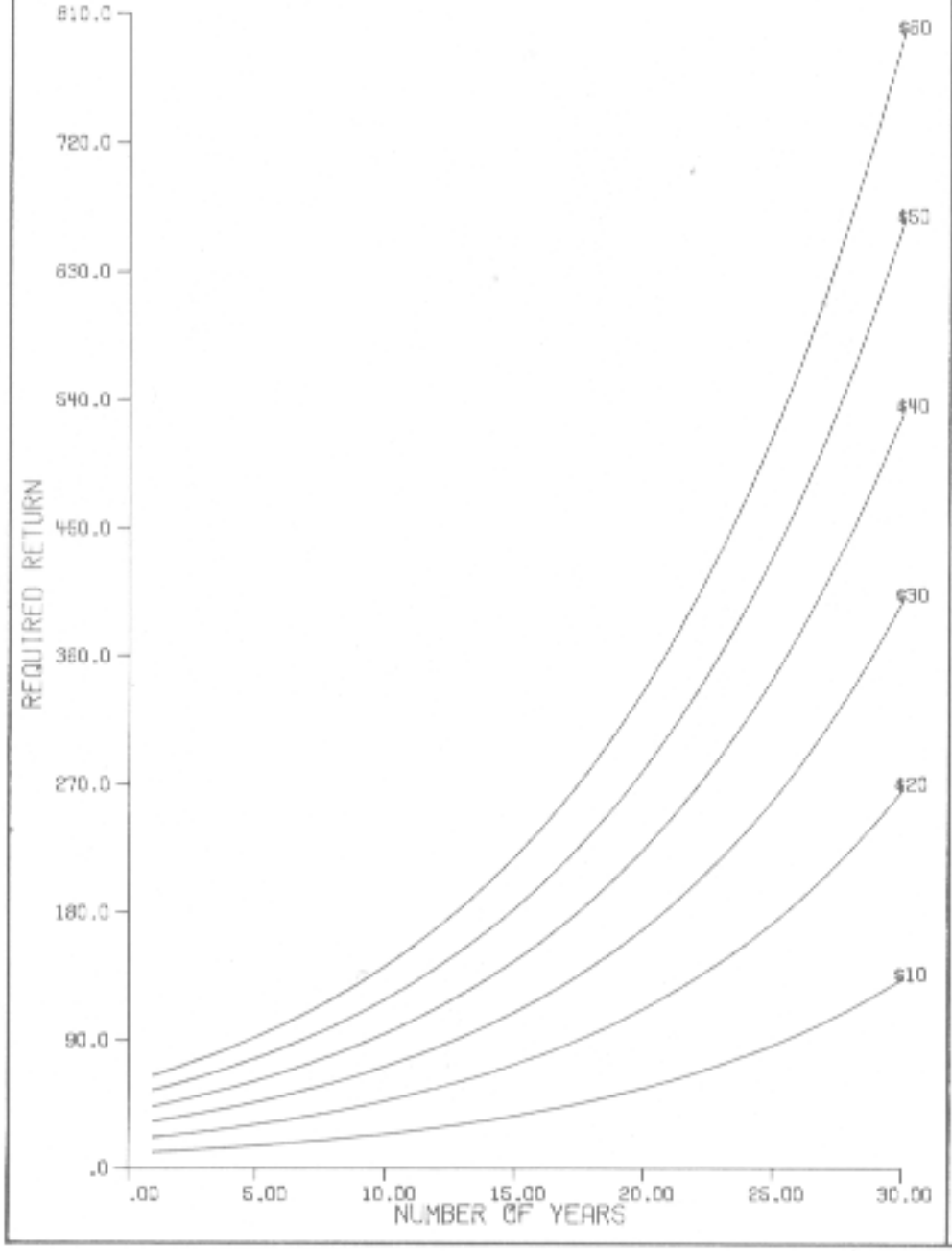
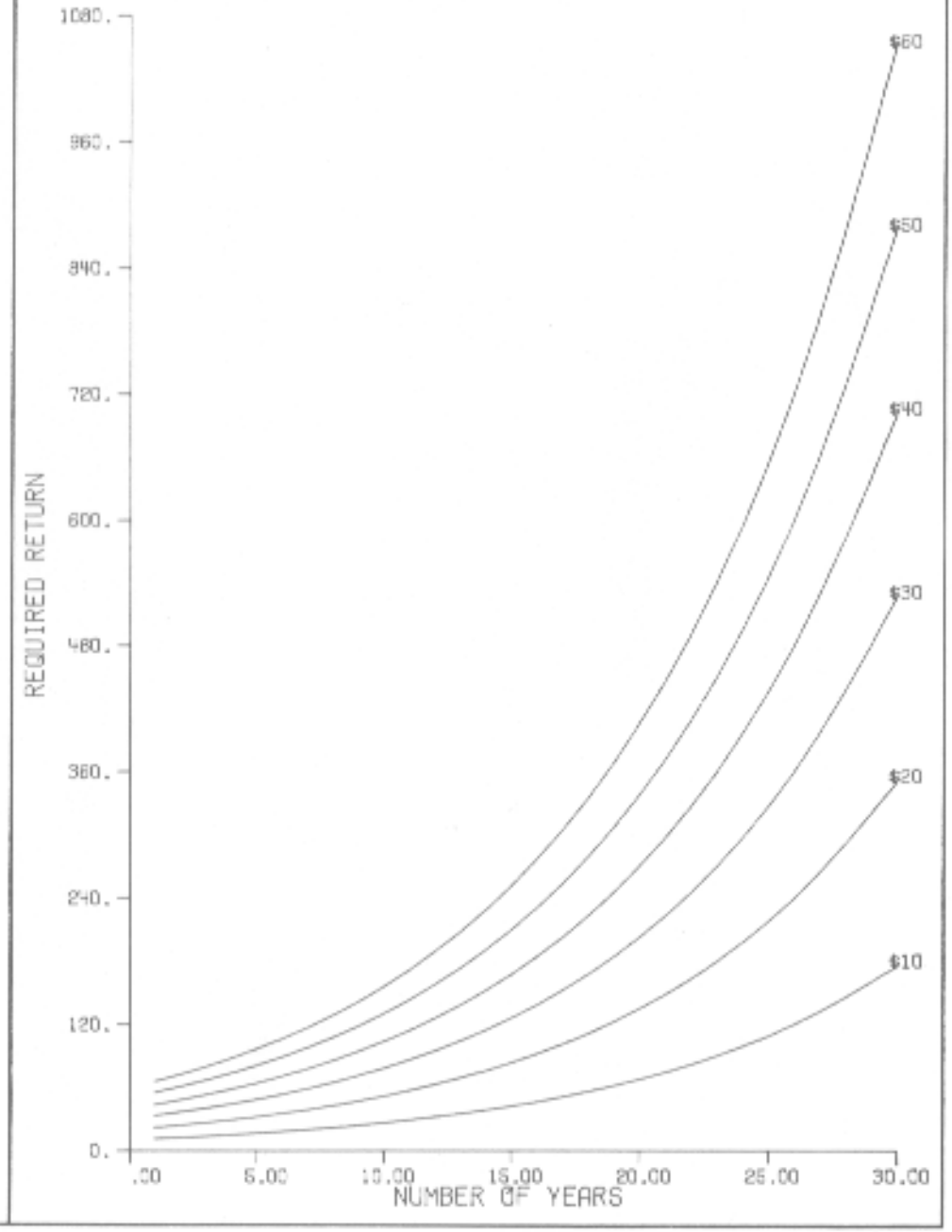


FIG.6 DOLLAR RETURN REQUIRED AT 10 PERCENT FOR VARIOUS INVESTMENT LEVELS.



Purdue University
Forestry and Natural Resources
Timber Marketing

Marketing Timber

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Marketing is the process of selling timber to obtain its true fair market value. This publication discusses key points that a woodland owner should consider when marketing timber. It should be read in conjunction with FNR-138, *How to Get The Most From Your Timber Sale*.

Achieving a reasonable financial return on a timber investment depends on many factors. None is more critical, however, than proper marketing. Even if financial gain isn't the primary goal, proper marketing can reduce the cost of achieving other management objectives, such as creating wildlife habitat.

You may have a wide variety of objectives for your woodlands. Harvesting is compatible with most non-financial objectives. Insisting that the logger follow best management practices (BMP's) will ensure the maintenance of a healthy natural environment. Logging activities may temporarily reduce aesthetic quality, but this depends on the proportion of the trees removed and the extent to which the tops are removed for firewood or cut up for faster decomposition. Eventually, stumps and openings will be the only evidence of logging activity. See FNR-185 for aesthetic, recreational, and cultural aspects of forest management.

Timber Harvesting and Forest Management

The specific trees selected for harvest determine the following:

- willingness of potential buyers to make an offer to buy your timber,
- amount they are willing to pay,
- trees left to produce your next crop,
- openings for regeneration, wildlife habitat, and
- aesthetic appearance you desire.

The science of forest management is based on the principle that whatever vegetation currently occupies an area of land grows to fully occupy the available growing space. Owners find that cutting trees by conducting a commercial harvest or timber stand improvement (TSI) controls the composition of this vegetation.

Timber Markets and Stumpage Valuation

Owners may be concerned about getting a fair price for their timber, because published prices are available for most widely traded commodities, but not for timber. This is due to the large number of species and tree qualities and relatively small number of timber sales in a given geographic area.

Logs are bulky and expensive to haul. For that reason, the market area for timber is defined by the timber buyers with processing facilities within approximately one hundred miles of the sale site. An exception is high-value logs that may be hauled to a seaport for export, or to processing facilities in other regions of the United States.

Woody Barton, an award winning Tree Farmer in Owen County, IN stands beside a veneer quality white oak tree on his land. Photo credit: W. L. Hoover

Derived demand. The demand for timber, either as stumpage or for unprocessed logs, comes from the "primary wood-using industries" and export markets. Stumpage is the term used to refer to trees standing in the woods before additional costs are incurred

for cutting them down (*felling*), cutting the trunk of the tree into logs (*bucking*), and moving the logs out of the woods to be loaded on a truck (*skidding*). Collectively, these costs are referred to as "*logging costs*." An additional cost is transportation of the logs to a processing facility (*hauling*). The "primary industry" converts logs into lumber and veneer. The "secondary industry" converts the lumber and veneer into end products such as furniture, household fixtures, millwork, flooring, pallets, and many others. The value of your stumpage is derived from the amount consumers are willing to pay for these end products less the processing costs, for example,

Stumpage Value = Product Value – Logging Cost – Hauling Cost – Sawmilling Cost – Furniture Production Costs

Product specifications. Each industry has unique species, log size, and log-quality requirements based on its end-product requirements, and processors within the same industry may have unique purchasing standards. Therefore, not all species, sizes, and qualities of logs will be used by any given mill. This creates large price differentials among species and qualities of logs. It also creates the need for middlemen, such as brokers, who specialize in matching the needs of particular mills with available log supplies.

Value factors. In addition to final-product values and processing costs, a number of other factors affect the value of your timber.

- *Species.* Differences in value among species can be as much as 1000 percent.

Log brokers buy logs from many sources and prepare them for resale. Here a broker is scaling logs at his concentration yard to determine their volume in board feet, Doyle log rule. Photo credit: W. L. Hoover

- *Size.* Larger trees generally contain more knot-free wood than smaller ones. In general sawtimber-sized trees are worth more per unit of volume than pulpwood-sized trees, and veneer quality trees are worth more per unit volume than sawlogs.
- *Quality.* Larger diameter trees with no branch scars on the first 12 to 36 feet of the trunk have more knot-free wood than trees with many branch stubs.
- *Volume of sale.* Fixed logging costs are lower per unit of volume produced as the total volume logged at one location increases. Fixed costs include roads, construction of a place to load logs (*landing*), drainage structures, and moving equipment between jobs. Lower unit cost means the logger can offer more. A small sale would generally be 25 thousand board feet (MBF) or less. A large sale would be over 100 MBF.
- *Distance to market.* The closer the mill is located to the logs purchased, the lower the hauling costs.
- *Site accessibility.* All other things being equal, timber in tracts that are easily accessed by log trucks is more valuable.
- *Logging difficulty.* Steepness of terrain and soil moisture conditions determine the logging equipment that can be used and the efficiency of this equipment.
- *Market conditions.* The market strength for a given species and quality of stumpage varies by season, market cycle, and many other factors.
- *Buyer's log inventory.* When a mill's log inventory is low, buyers may offer more for logs to keep their mill in operation.

Sources of price information. Long-term price trends for logs purchased by Indiana mills are reported in the "Indiana Forest Product Price Report and Trend Analysis" compiled by Purdue's Department of Forestry and Natural Resources. It is published in *The Woodland Steward* and available on-line at http://www.inwoodlands.org. To be added to *The Woodland Steward* mailing list, contact Purdue Cooperative Extension Service, Department of Forestry and Natural Resources, Purdue University, West Lafayette, Indiana 47907-1159, http://www.fnr.purdue.edu (765) 494-3583. A quarterly stumpage price report is also available. It is based on sales in which a consulting forester assisted. This report is available from the same sources.

Ways To Designate Timber To Be Sold

It is important that you and potential buyers understand which trees you intend to sell. Designation can be based solely on boundary limits, tree diameter limits, or marks on individual trees. Another method is to conduct the harvest yourself and sell logs rather than selling the stumpage.

Area limit. Boundaries are defined, and all the trees within these boundaries are for sale. This could be your entire ownership or a portion thereof. This method may be appropriate if you want to make a clearcut to regenerate species needing direct sunlight or to clear land for conversion to non-forest uses. Otherwise, it is not recommended because of the potential for misunderstandings with the buyer, and because it frequently is not the appropriate timber management practice.

Diameter limit. All trees larger than a certain diameter breast height (dbh) are for sale. Boundaries need to be defined. This method usually results in "high grading," that is, cutting only the best trees and removing smaller diameter trees that may provide the highest financial return during the next growing cycle. Continual high grading results in the accumulation of poor-quality trees and a decrease in the value of the residual stand, as discussed in FNR-138 and FNR-182.

Single-tree selection. Each individual tree for sale is marked with paint spots, one at eye level and one at ground (*basal*) level. The basal paint mark remains visible on the stump after cutting. When the logging is completed this allows you to verify that only marked trees were cut. This is the method usually recommended by foresters. Factors to consider in selecting harvest trees are discussed in FNR 91 and 138.

Self-harvest and sale of logs. Conduct the harvest yourself or hire a logger. Both result in selling logs, not stumpage, and greater financial and physical risk. Unless you know the log specifications of buyers in your area, this method is not recommended. Logging is a dangerous activity, even for professional loggers.

Steps in Marketing Timber

The major steps in marketing timber are as follows:

1. Seek assistance from a professional forester,
2. Select trees to be marketed considering your forest management and other objectives,
3. Estimate timber volume and range in value,
4. Determine bid procedures,
5. Advertise the sale,
6. Evaluate offers and select a buyer,
7. Negotiate the timber sale contract with the buyer, and
8. Monitor the sale for compliance.

1. Professional Assistance. Most landowners probably don't market timber very often; however, timber buyers do this for a living. Their employers expect them to purchase, at minimum cost, timber that meets their company's needs. As such, the landowner most likely will be at a disadvantage in this process. Assistance from a professional forester who earns his or her living in part by marketing timber for landowners is recommended. In Indiana, limited marketing assistance is available at no charge from District Foresters employed by the Indiana Department of Natural Resources (IDNR), Division of Forestry. Complete marketing service is available, for a fee, from private, self-employed, consulting foresters. Directories of district and consulting foresters are available at county Extension offices, at http://www.inwoodlands.org and at district forester's offices.

Red oak properly marked for sale. White band and basal spot were made by a consulting forester. Circle was made by timber buyer who assessed marked timber for possible bid. Photo credit: W. L. Hoover

2. Select Trees to be Marketed. See FNR-138, *Tips on How to Get the Most From Your Timber Harvest* and FNR- 91, *Financial Maturity: A Guide To When Trees Should Be Harvested*. Providing buyers with a species and quality mix they will be interested in buying is part of the timber marketing process. This consideration must be weighed against the many other factors influencing the selection of trees to include in the sale.

3. Estimate Volume and Value. After the trees to be sold are identified, estimate their volume and approximate quality by species. This should be done

Cavity in this tree may indicate that it should be removed in the next harvest. However, if wildlife is an important goal, your forester may recommend leaving it stand.
Photo credit: W. L. Hoover

regardless of the designation method used. The volume of trees to be marketed for sawlogs and veneer logs is measured in board feet according to the Doyle Log Rule. See FNR-191, *Log and Tree Scaling Techniques*. Pulpwood is sold by the ton or cord. Use this volume data and the price estimates to calculate a possible range in fair market value. If you are working with a consulting forester, he or she should provide you with this estimate. Use it only as a guide to evaluate purchase offers or bids.

4. Select Bidding Procedures. Oral auction or sealed bids may be used. Sealed bids are the most common. They ease administration of the sale, reduce time spent by you and potential buyers, and protect your interests by requiring payment of earnest money. Bids are submitted at the time and place you designate in the sale announcement.

- *Sealed bids.* Bids may be received by hand delivery, mail, phone, fax, or e-mail. Open them at the appointed time and place. Representatives of interested buyers are frequently present. A business-like attitude during bid opening should insure a more professional relationship with the logger. Select the winning bidder, or reject all bids. Accept a bid only if you are satisfied the price offered is adequate when compared to the initial estimate and the other bids, and that the winning bidder is trustworthy and competent. After opening the bids, do not reject them all, and then ask for higher bids from the buyers present. The buyers are not prepared to bid again, and those not present cannot enter the bidding. Selection of the winning bidder is called "awarding the bid." After awarding the bid, a timber sale contract should be negotiated with the winning bidder. The winning bidder should provide you with earnest money, or a down payment, at the opening or very shortly thereafter.
- *Oral auctions.* Interested buyers bid on the timber at a designated time and place. Some believe this procedure guarantees interested buyers will bid the price to the highest level possible. However, many buyers do not like oral auctions and will not participate in them. They may be appropriate, however, if your timber is especially valuable. A variation of oral bidding is to require a written opening bid with earnest money followed by an oral auction for those who submitted a written initial bid.
- *Right to refuse all bids.* The right to refuse any and all bids should be reserved in the timber sale announcement. This protects you from having to sell your timber at an unacceptable price or to a buyer with whom you are not comfortable working. However, do not use the bidding process to obtain a free timber appraisal. Buyers will not be receptive to future sales if you do.

5. Advertise Sale. Timber selling becomes timber marketing only by making certain all potential buyers are made aware of what you have to sell. You must also convince buyers that your timber meets their needs. The more information you provide, the better your chances of getting them to inspect your timber and make an offer.

The following information should be included in a sale announcement:

- Legal description (provide a map) of sale area and designation of trees for sale,
- Dates property will be available for inspection,
- Date, time, and place bids will be received and opened, or an auction held,

- Who marked the timber,
- Address where bids or offers should be sent, and
- Right to refuse any or all bids or offers.
- If sale trees have been marked individually, provide a list of the number of trees by species and volume. If the sale trees are not marked, provide an estimate of total volume. In either case, provide an estimate of quality.
- List of contract provisions and form of sale desired, and
- Other items you believe pertinent to the sale should be listed.

Names and addresses of timber buyers are available from the Indiana Division of Forestry. They maintain a list of all firms and individuals licensed to buy timber in Indiana. The sale can also be advertised in your local newspaper. The best outlet, however, is the *Indiana Licensed Timber Buyers Bulletin*. It is published monthly by the Indiana Division of Forestry and sent to all companies and individuals licensed to purchase timber in the state. This free service is offered to assist woodland owners in locating markets for their timber products and to aid licensed buyers in locating sources of timber.

Timber Sale Contract. There are two basic types of timber sale contracts: "lump sum" and "pay-as-cut," as well as variations of these basic types.

- *Lump sum.* The buyer agrees to pay a fixed amount. The advantage to you is that the amount is not dependent on any future event, such as damage to the standing timber, timber theft, or overestimation of the value of the timber. Generally, you should be paid the full amount due prior to the start of the harvest; however, you may contract to receive installment payments on designated future dates. In this case, it is appropriate to require interest on the deferred payments. The schedule of payments and interest should be specified in detail in the written contract. If you are not paid interest, the Internal Revenue Service may require that you report a portion of your gain as ordinary income instead of as capital gain.

  The lump-sum contract is recommended for most Indiana timber owners. It does not depend on the logger or other party to tell you how much timber has been cut; however, special marketing conditions may make another form appropriate. For example, if you are marketing low-quality timber as part of a timber stand improvement, a shares contract may be the only way to sell it.
- *Pay-as-cut.* You retain title to the timber until it is cut. This is also referred to as an "economic interest retained" contract. The buyer agrees to purchase timber at a given price per unit volume of the cut product, usually logs. The contract price per unit may be an average or per species and log grade. The determination of the volume and grade of the logs cut is an administrative burden. Frequent inspection by you or your agent may be required during logging to assure an accurate accounting.
- *On-the-shares.* You agree with a logger to share the money received from selling the logs produced from your timber. The split is usually a fixed percentage for you and for the logger. For administrative and tax purposes, it is important to specify in a written contract the relationship between you and the logger.
- *Logging service.* You pay the logger a set fee per unit volume to cut and haul the timber to a log buyer you designate. The logs belong to you until you sell them. To prevent discrepancies between your estimate of timber volume cut and the volume delivered to a mill, it may be necessary for you or your agent to measure the logs at the loading point in the woods *(the landing)* before the logs are loaded and hauled to the buyer.

Modern logging equipment like this feller-buncher cuts the tree, bucks logs, and piles logs to be picked up by another machine and hauled to log landing.
Photo credit: W. L. Hoover

- *Written contract strongly recommended.* To reduce the possibility of misunderstandings and disagreements, a written contract between buyer and seller is essential. "Handshake" agreements are not a good business practice and may not be enforceable in a court of law. Timber buyers and foresters can provide you with a standard timber sales contract, but be certain to review it for the specific terms you agreed to. A sample contract is included at the end of this publication. An attorney should prepare and execute the contract.
- *Legal note.* Standing timber, like land, is real property. However, Indiana statutes provide that timber subject to a contract of sale which calls for the buyer to remove the timber within a reasonable period of time is subject to the provisions of the Uniform Commercial Code, rather than the provisions for the sale of real property. This means that it is not necessary to register the contract at the county courthouse, but it may be in your interest to do so. It is also in the interest of the buyer to have the contract registered in case title to your land changes prior to the removal of the timber.
- *Checklist of contract provisions.* The following checklist contains important provisions to include in a contract.
  - A statement that you, the seller, are the lawful owner of the property conveyed to the buyer, and the identification of any other co-owners must be included. If you do not have legal authority to sell the timber without consent of other co-owners, their signatures will be required on the contract.
  - The buyer and his employees have the right of access as necessary to perform their functions under the contract.
  - Transfer or exchange of the property from you and any other co-owners to the buyer.
  - Total amount to be paid by the buyer, if a lump sum amount, or price per unit volume, and the procedure for determining the volume harvested.
  - Date payment is due, or schedule of payments, if more than one payment is to be made.
  - Legal description of the land, location of access points, information on access easements, if any.
  - Description of how the trees sold are designated or marked.
  - Restrictions on both the buyer and you, if any. Examples might include the following:
    - — You cannot enter into additional contracts involving the area of the sale for the period covered in the contract without the buyer's permission.
    - — Activities are to cease if certain weather conditions occur, such as extreme drought creating a fire hazard, or heavy rainfall that results in severe rutting by logging equipment.

Logging during very wet weather and in areas adjacent to streams can cause severe rutting and sedimentation of streams. Photo credit: W. L. Hoover

  - Provisions for damage to residual trees and/or existing improvements from the harvest operation. How will these be assessed and for what types of damages must you be reimbursed?
  - Provision for the cutting of trees not sold in the contract.
  - Status of sold but uncut trees. Must all marked trees be cut?
  - Requirement for all activities to be conducted according to Indiana Best Management Practices (BMP's). This usually means selling your timber only to a buyer who uses loggers who have received BMP training. You may also want to give preference to buyers participating in the Sustainable Forestry Initiative (SFI) sponsored by the Indiana Forest Industry Council (IFIC). In addition to requiring compliance with BMP's, you may want to contract specifically for,
    - — The location of logging roads and skid trails,
    - — Road construction specifications, and

— Post-logging road and skid trail closure, including the installation of water control devices and seeding.

- How long the contract remains in effect. Specify the total number of days or a termination date and how an extension of this date may be arranged. Reasons for extensions could include wet weather, prevention of crop damage, or conflicting uses at various times of the year.
- Disclaimer of your liability for personal injury during the buyer's performance under the contract. You should require the buyer to carry insurance to guarantee his or her ability to pay in a liability case. State this requirement in the announcement of the timber sale.
- Methods of modifying the contract, and the conditions for a resale.
- Require an on-site pre-logging conference with the seller, the logger, and a consulting forester to clarify expectations and avoid misunderstandings.
- If you choose to rely on arbitration instead of court action in case of a dispute, specify the arbitration procedures to be followed.
- Signatures. Read the contract carefully before signing it. Be sure that you and the buyer understand and agree on all the provisions of the contract. You'll also need to have the signatures witnessed.

Other Considerations

Many other activities must be carried out to assure a trouble-free timber sale.

Notify Adjoining Land Owners. Owners of land adjoining the woodland to be harvested should be notified. Offer to walk adjoining property lines with them. Let them know how to contact you or your designated representative if they suspect inappropriate activity is occurring.

Monitoring the Sale for Compliance. You and any representative you designate have the authority and responsibility to inspect operations as long as you **do so in a safe manner**. Always announce your presence to logging crews when you come onto the site. Monitoring ensures that all contract provisions are being met, that only timber designated for harvest is removed and that unnecessary damage is prevented. If there are any questions or complaints, immediately notify the logger on the site and the buyer if different. Attempt to rectify the problems at once; usually they can be worked out without a third party.

After all cutting is completed, make a final inspection of the property to ensure all contract violations are corrected or compensated for. Send a letter to the buyer stating all provisions of the contract have been met and the buyer is released from further obligations.

When hiring a forester, ask if he or she will monitor the logging operation in progress and inspect the site upon completion. Consider contracting for the forester to be on site when the final BMP practices are being installed.

Sell Only to Licensed Buyer. All persons and firms that buy timber in Indiana, including out-of-state buyers, are required to have a registration certificate issued by the Indiana Department of Natural Resources, Division of Forestry. This license must be renewed annually. Each licensed buyer and registered agent is furnished an identification card giving his or her name, the person or company for whom he or she is buying, business address, and license number.

"Timber" is defined as trees, standing or felled, and logs which can be used for sawing or processing into lumber. Firewood, Christmas trees, fruit, and ornamental trees are not included.

Licensed timber buyers are required to post a surety bond or certificate of deposit with the Department of Natural Resources. In the event a buyer fails to pay for timber purchased, or fails to pay legally determined damages for timber wrongfully cut, you can seek restitution by forfeiture of this bond.

Minimize Income Tax. The time to consider tax implications is before the timber marketing process starts. Favorable tax treatment depends on how the timber is sold, and determination of the total volume of timber on your land, as well as the volume sold. The gain from selling stumpage is usually eligible for long-term capital gains treatment. Profit from selling logs is not, unless you elect to treat the cutting as a sale under Sec. 631(a) of the Internal Revenue Code. You may also be able to recover your investment in the timber sold by claiming a depletion allowance. This allowance is based on the amount you paid for the timber or its fair market value on the date of death of the person from whom you inherited it.

Please note that timber sale income is subject to Federal and state income tax even if the buyer does not send you an IRS Form 1099. This applies whether you are paid by check or in cash.

For complete details consult the **National Timber Tax Website** at http://www.timbertax.org

Post-harvest Investment. Achievement of your objectives may require additional monetary investment, and your timber harvest income may make this feasible. Examples of post-harvest investments are tree planting, wildlife habitat improvements, fencing to restrict grazing, road improvements, or timber stand improvement (TSI). A review of your future plans is a good idea following a timber harvest, as discussed in FNR-181.

Best Management Practices (BMP). These are guidelines loggers follow to minimize the impact of logging on water quality. The focus is on sedimentation of waterways from soil erosion both during and after logging. You can review BMP's by requesting an Indiana BMP Guidebook from the Indiana Division of Forestry or on line at http://www.state.in.us/dnr/forestry/bmp/log1.htm BMP's are also discussed in FNR-184.

Decay of logging slash less than two years after the harvest. Photo credit: W. L. Hoover

Excellent regeneration 10 years after a salvage harvest necessitated by a severe wind storm.
Photo credit: W. L. Hoover

Summary

Satisfactory timber sales are the result of planning. Organization and patience are essential. Buying and selling timber is more than just wheeling and dealing over price. It is a business transaction and a critical step in the implementation of your forest management plan. Properly conducted timber harvests that are profitable to the landowner are the key to retaining Indiana's forests. Your ability to make money from your timber will prove to other forest landowners that it is not necessary to subdivide and develop forestland to make a profit.

Related Publications

Contact your county Extension Educator or Ag Communication, Media Distribution Center, 1187 Service Building, Purdue University, West Lafayette, IN 47907, or call toll free at (888) 398-4636. Most of these publications are also available on line at: http://www.agcom.purdue.edu/agcom/Pubs/fnr.htm.

FNR-4	*How to Make and Use the Tree Measuring Stick*
FNR-84	*Hardwood Log Grades and Lumber Grades: Is There a Relationship*?
FNR-86	*The Economics of Timber Stand Improvement*
FNR-87	*Forestry and Wildlife Management Assistance Available to Indiana Woodland Owners: Providers and Programs*
FNR- 91	*Financial Maturity: A Guide to When Trees Should Be Harvested*
FNR-101	*Timber Harvesting and Logging Practices for Private Woodlands*
FNR-138	*How to Get the Most From Your Timber Sale*
FNR-181	*A Landowner's Guide to Sustainable Forestry in Indiana, Part 2. Planning for the Future*
FNR-182	*A Landowner's Guide to Sustainable Forestry in Indiana, Part 3. Keeping Your Forest Healthy and Productive*
FNR-184	*A Landowner's Guide to Sustainable Forestry in Indiana, Part 5. Forests and Water*
FNR-185	*A Landowner's Guide to Sustainable Forestry in Indiana, Part 6. Maintaining the Aesthetic Beauty and Enhancing the Recreational and Cultural Values of Your Forest*
FNR-191	*Log and Tree Scaling Techniques*

TIMBER SALE CONTRACT (lump sum)

(example only, legal counsel should be consulted)

Note: Seller and Purchaser should initial and date each page of a multiple page contract.

Contract entered into this _____ day of _____, 20 _____, by and between _____ of _____ Indiana hereinafter called Seller, and _____ hereinafter called the Purchaser,

WITNESSETH:

1. Seller agrees to sell and Purchaser agrees to buy for the total sum of _____ Dollars ($_____) under the conditions set forth in this contract all standing timber marked for cutting upon an area of approximately _____ acres in the _____ of Section _____TWP _____ _____, _____ County, Indiana on land owned and recorded in the name of _____. The location of the area can further be described as follows: _____. Purchaser further agrees to pay Seller the sum of _____ Dollars ($ _____) payment to be made in accordance with the following schedule:

   _____

   Purchaser further agrees to post a performance bond of _____ Dollars ($ _____) with _____.

2. Seller further agrees to dispose of the timber conveyed in this contract in strict accordance with the following conditions:
   a. All trees to be included in this sale will be marked as follows:

      _____

   b. No concurrent contract involving the area or period covered in this contract has been or will be entered into by Seller without the written consent of Purchaser.
   c. Purchaser and his employees shall have access to the area at all reasonable times and seasons for the purpose of carrying out the terms of this contract.
   d. Seller covenants that he is the lawful owner of the above timber and that no indebtedness or encumbrances exist against the same.
   e. Other conditions: (examples – compliance with Indiana Best Management Practices (BMP's), stoppage for wet weather, protection of adjoining agricultural crops, hunting season, etc.)

      _____

3. Purchaser further agrees to cut and remove the timber conveyed in the contract in strict accordance with the following conditions:
   a. Unless an extension of time is agreed upon in writing between the Seller and the Purchaser, all timber shall be paid for, cut and removed on or before and not later than the _____ day of _____ 20_____, and ownership of any material not so removed shall revert to the Seller.
   b. Only marked trees may be cut, but the Purchaser shall retain the right to leave standing such marked trees as he or she may consider not to contain merchantable material worth removing from the area. (Some contracts require Purchaser to fell, but not remove such trees.)
   c. Unmarked trees and young timber shall be protected against unnecessary injury from felling and logging operations.
   d. Necessary logging roads shall be cleared by Purchaser only after their locations have been definitely agreed upon with Seller or his representative.
   e. During the life of this contract and on the area covered, care shall be exercised by Purchaser and his employees against the starting and spread of fire and they shall take reasonable precautions to prevent and control fires.
   f. Fences damaged or destroyed by Purchaser in the logging or removal of timber included in this contract shall be repaired or replaced by Purchaser to the condition existing at the time the logging begins.

g. Any liability for damage, destruction, or restoration of private or public improvements occasioned by or in the exercise of this contract shall be the sole responsibility of Purchaser.

h. Other conditions: Examples include:

i. All marked trees will be felled.

ii. Tops of trees marked for sale are property of Seller/ Purchaser (specify which).

iii. All litter and garbage created by logger is the responsibility of Purchaser and is to be picked up at least weekly.

iv. Specifically identified plantings, all waterways to maximum possible extent, special trees, wildlife area, etc. are to be avoided by the logger.

v. All logging roads and skid trails will be graded and water barred before termination of this contract.

4. Purchaser hereby agrees to protect, indemnify, and save harmless Seller from any and all liability for personal injuries, death and/or property damage suffered or incurred by any person in connection with Purchaser's performance of this contract. Purchaser also agrees to furnish insurance of the following types and amounts: (Examples – liability and workmen's compensation)

_____.

5. Seller and Purchaser mutually agree as follows:

a. All modifications of this contract will be reduced to writing, dated, signed and witnessed, and will be attached to this contract.

b. Resale of any portion of the standing timber conveyed by this contract will not release the Purchaser from all the terms of this contract unless Seller signs a written release.

c. The total number of trees conveyed is _____, composed as follows:

_____.

d. In case of dispute over the terms of this contract, final decision shall rest with a reputable person to be mutually agreed upon by the parties to this contract. In the case of further disagreement, with an arbitration board of three persons, one to be selected by each party to this contract and the third to be selected by the other two.

IN WITNESS THEREOF, the parties have executed this agreement as of the day and year first above written.

WITNESS:

_____ _____

(Purchaser)

_____ _____

(Licensed Timber Buyers Number)

WITNESS:

_____ _____

(Seller)

_____

Purdue University
Forestry and Natural Resources
Timber Marketing

Tips on How to Get the Most from Your Timber Harvest

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Introduction

The sale of timber from your woodland is an important financial undertaking. Unfortunately, timber sales often result in a dissatisfied landowner and a decrease in the potential of the woodland to produce future crops of valuable timber on what may be productive timberland. This can result from a poor contract and misunderstandings with the buyer and logger. You can, however, make your timber sale a positive experience.

Prior knowledge of a few important facts, along with adherence to some basic forest management principles allow you to receive a fair price for your timber and retain a woodland that is in good condition to produce continuous supplies of many valuable natural resources such as timber, wildlife, clean water, and scenic beauty.

The critical factors you should consider when selling timber are discussed in this publication. It supplements FNR-91 Financial Maturity: A Guide to When Trees Should Be Harvested, and FNR -111 Marketing Timber.

Some Things You Should Know Before You Sell Timber

Timber values vary: Indiana hardwood timber can be very valuable, but it can also be of low quality and have little monetary value. Value depends on the species and quality of your timber. Ease of accessibility to your woodlands and seasonal weather conditions also affect value. Professional judgment based on marketing experience is required to estimate the fair market value of standing timber.

Sold in a spot market: Timber is not a widely traded commodity. Standing timber is sold in a "spot market." This means that each sale stands alone. Unlike agricultural commodities, there is no source of quoted prices on a given date for the many species and qualities of timber commonly found in Indiana woodlots.

Bid sale is usually best: Spot markets require a way to attract buyers to each individual sale. This is accomplished by putting timber up for bid. Bids establish the unique fair market value of timber. In some cases a one-on-one negotiation between a landowner and a reputable buyer well known to the landowner is appropriate.

Know what you are selling: Have a forester inventory your woodland to assess its overall health and the trees available for harvest now and for future growth. He or she may also note trees of little value that need to be removed to make room for the growth of crop trees. Discuss the inventory with your forester. If a sale is needed to meet your financial needs and/or improve future timber income potential, the trees to be harvested should be marked by the forester. The forester will carefully measure the volume and assess the quality of these trees.

A listing of board foot volumes by species should be made available to all prospective bidders in a sale announcement, demonstrated by Table 1. The sale announcement may also include the forester's comments about the quality of the timber.

Species	Number of Trees	Volume (bd. ft.)
White Oak (lumber)	15	3500
White Oak (veneer)	3	700
Red Oak	30	9000
Hickory	20	4000
Sugar Maple	15	3000
Tuliptree	10	8000
TOTALS	93	22,200

Table 1. Sample listing of timber for sale to send to potential buyers.

Avoid "diameter limit cut": If you are offered a fixed amount from a buyer for the right to cut and remove all trees in your woods that are above a certain diameter, for example, "16 inches and larger," you should be very cautious. This type of sale makes it difficult to assess the value of the timber subject to sale, and it is unlikely to leave you with the species and quality of trees needed to maximize financial returns in the long run.

- Know what trees are sold: It is never a good idea to sell something if you do not have some idea of its approximate value. At the very least, get the advice of a forester before entering into a diameter-limit contract. The buyer may be talking about stump diameter, while you are thinking of diameter at chest or "breast height" [diameter breast height (DBH) tree diameter at 4½ feet above ground line]. A 12-inch DBH tree can easily have a stump diameter of 16 inches, and could be cut under this diameter limit agreement.
- Retain trees to produce next crop: Tree size alone is a poor method for deciding which trees to harvest. A trained forester takes into account many factors before marking a tree to be cut. These include species, health of individual trees, rate of volume growth, rate of value growth, overall stand conditions, and most important of all, your overall objectives for your woodland.

Selling "on shares": This is an agreement under which you allow a logger to harvest timber on your land, and you are paid an agreed portion of the revenue the logger receives from the sale of the logs. This type of agreement may be appropriate for small volumes of low-quality timber that would otherwise be difficult to sell. It is not recommended if it would be possible to sell your timber by marking it, agreeing to a fixed sale price, and signing a written contract. The capital gains treatment of revenue from timber sold on shares is questionable. Consult the National Timber Tax Web Site for details (http://www.timbertax.org).

Always have a written contract: If problems arise during the sale and logging operation, your options to seek redress are severely limited if you do not have a written contract with the buyer. The services of an attorney are recommended for sales involving substantial monetary sums or legal complications.

Require BMP compliance: The forestry and forest products industries in Indiana have adopted voluntary Best Management Practices (BMP's) for timber harvesting. These BMP's have been published in a guidebook available from the Indiana Division of Forestry and on the Web at http://www.state.in.us/dnr/forestry/bmp/log1.htm. You should include in your timber sale contract a requirement that the buyer or any sub-contractor of the buyer must comply with these BMP's in all respects.

Select a buyer participating in Sustainable Forestry Initiative (SFI): Given a choice, select a buyer who will use loggers with BMP and safety training. This may or may not be the highest bidder. In addition, you should give preference to buyers who participate in SFI sponsored by the Indiana Forest Industry Council (IFIC) under the auspices of the American Forest & Paper Association (AF&PA). The SFI program provides training to loggers in sustainable forestry and protection of the environment through Indiana's BMP program.

Know the tax treatment of timber income before selling: Federal income tax rules are complicated. You may not qualify for the lower tax rate afforded long-term capital gains income unless your sale contract includes specified provisions. Details can be found at the national Timber Tax Web Site under "Quick Links, Timber Income."

How to find a forester: Find a forester as you would any other professional, that is, by "asking around." Your neighbors may have used a forester. Your county Purdue University Extension office, the Indiana Department of Natural Resources Division of Forestry (Indianapolis), or Purdue University's Department of Forestry and Natural Resources have lists of consulting foresters. The Indiana Forest and Woodland Owners Association publishes a directory of consulting and industrial foresters. It is available online at http://www.indianawoodlands.org. Obtaining the services and advice of an experienced forester is always worth your investment in time and money for both near-term income and long-term returns from your woodland.

Your Timber Investment May Be Growing Faster Than You Thought

A forester in consultation with you, the landowner, considers many factors before he or she decides to choose a specific tree to mark for harvest. One important criterion is financial maturity. This is the point in time when the financial rate of return from leaving a tree to grow until the next harvest is less than the rate that could be earned by cutting the tree and investing the proceeds in an alternative investment. For example, if a tree is expected to increase in value at 4 percent per annum, and the tree's owner could earn 6 percent on a bank certificate of deposit (CD), the tree would be financially mature.

You may question whether your crop trees can earn 10 percent per year? Most can't if you are thinking only about annual increase in physical volume. The situation changes, however, if you also take log quality or grade increases into account. As most trees increase in diameter, they also increase in quality. This translates into increased value per board foot. The total financial return is determined by the growth in volume, the increase in log quality, and any increase in the market price per board foot.

Typical growth rates for the most valuable species are shown in Figure 1. The annual compound rates of increase in volume and value are presented. Growth rates by species were estimated from the 1998 forest survey data (Schmidt, et. al., 2000). Stumpage prices were taken from the *1985 and 2000 Indiana Forest Products Price Report*

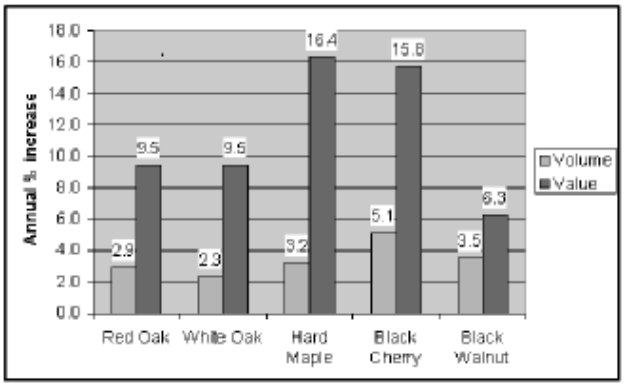

Figure 1. Comparison of volume and value growth rates for high-value hardwood species.

and Trend Analysis. Note that the rate of value increase includes the affect of inflation. Tree diameter in 1985 was assumed to be 16 inches, and tree volume was taken from Herrick, 1956.

Figure 1 shows that the rate of value growth exceeds the rate of volume growth. Even after reducing the rate of value increase by 3 to 4 percent for inflation, the real rates of return indicate that timber can be a good investment. Foresters can provide estimates of the potential returns from your particular woodlands. Your forest investment deserves professional guidance.

For more information, contact:

Purdue Cooperative Extension Service in your county, or Forestry Extension Office

Dept. of Forestry & Natural Resources
1159 Forestry Building, Room 201
West Lafayette IN 47907-1159
(765) 494-3583
karens@fnr.purdue.edu

IDNR-Division of Forestry & Natural Resources
402 W. Washington St., Room #296
Indianapolis IN 46204
(317) 232-4107
http://www.state.in.us/dnr/forestry/htmldocs/mailco.html

Suggested publications:

FNR-91 *Financial Maturity: A Guide to When Trees Should Be Harvested*

FNR-111 *Marketing Timber*

Literature Cited:

Herrick, A.M. 1956. *Composite Volume Tables for Indiana Hardwoods*, Purdue University Cooperative Extension Service, Extension Leaflet 273, West Lafayette, IN. (Table 1. Merchantable Volume Table for Indiana Hardwoods. Board Feet - Doyle Rule, Average Tree).

Hoover, William L. and Ralph W. Gann. *1985 and 2000. Indiana Forest Products Price Report and Trend Analysis*, Purdue University Cooperative Extension Service, West Lafayette, IN. (delivered log price less logging and hauling cost per MBF).

Schmidt, Thomas L., Mark H. Hanson, and James A. Solomakos. 2000. *Indiana's Forests in 1998*, USDA Forest Service, North Central Research Station, Resource Bulletin NC-196. (Tables 39A and 44A).

Knowledge to Go
Purdue Extension

NEW 6/02

Planting and Care of Fine Hardwood Seedlings

Hardwood Tree Improvement and Regeneration Center
Northern Research Station
USDA Forest Service
Department of Forestry and Natural Resources
Purdue University

Enrichment Planting of Oaks

Robert C. Morrissey[1], John Seifert[2], Nathan King[1], and Marcus Selig[1]
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Introduction

Oaks (*Quercus* spp. L.) have been one of the dominant trees of the Central Hardwood Region of the United States for thousands of years (Davis 1981; Abrams and McCay 1996). These valuable species are now a vital part of the region's ecology (wildlife food and habitat; biodiversity), economy, and cultural heritage (Harlow et al. 1996). Since the 1960s, there has been an increasing concern that oaks are not regaining a dominant canopy position following regeneration of harvested stands (Carvell and Tryon 1961). Many current forest management strategies (clearcutting; single tree and group selection) tend to favor alternative dominant species, depending upon site conditions (Seifert et al. 2005). Uneven-aged management strategies, such as single tree selection, tend to favor shade tolerant species, such as sugar maple (*Acer saccharum* Marsh.), red maple *(A. rubrum* L.), and American beech (*Fagus grandifolia* Ehrh.), rather than the more shade-intolerant oak species (Johnson et al. 2002). Thus, it is often necessary to explore other management and regeneration techniques if a land manager intends to maintain oaks as a significant component of the next generation of forests.

Enrichment planting, an artificial regeneration technique designed to improve the proportion of a desired species (Johnson et al. 2002), is one way of increasing the successful regeneration of oaks on most sites. This method is most often used in conjunction with certain even-aged harvesting methods, such as shelterwood (Loftis 1990), or with an uneven-aged harvesting method called group selection (Jacobs et al. 2006).

Shelterwood and group selection harvests effectively alter environmental conditions at the forest floor by creating gaps in the canopy through selective harvesting, while leaving a certain percentage of trees standing on the site. Increased light in the understory will allow formerly suppressed advanced regeneration (existing seedlings and saplings in the forest understory) to increase growth rates and compete for a dominant position in the forest canopy. Enrichment planting in these openings can be used in forests where advance oak regeneration is sparse, or when naturally regenerating species are undesirable and likely to out-compete the preferred timber species.

Shelterwood Harvest

Enrichment planting under a shelterwood harvest is often less expensive and more aesthetically pleasing, at least until the final removal of overstory trees, than artificially regenerating a site following a clearcut harvest. Clearcuts open a harvested site to complete sunlight, allowing unhindered growth of fast-growing, shade-intolerant species, such as yellow-poplar (*Liriodendron tulipifera* L.). Oaks tend to exhibit slower above-ground growth than many competing species, as they invest more energy in their extensive root systems (Johnson et al. 2002). Therefore, clearcutting often results in the overtopping of oaks by competing species with faster shoot growth. Once these young oaks are overtopped, their chances of attaining dominant canopy positions are greatly diminished. In contrast, a properly implemented shelterwood harvest system may provide greater control and success for regenerating oaks.

A shelterwood harvest will remove competing understory and a certain proportion of overstory trees, thus reducing competition for light, nutrients, and moisture. In addition, shade from remaining canopy trees will serve to limit the growth of faster growing, shade-intolerant woody vegetation. An ideal harvest

Figure 1. *Regeneration below a shelterwood cut at Purdue University's Martell Forest, West Lafayette, IN. (Photo courtesy of George R. Parker)*

will allow just enough of an increase in forest floor light to give oak seedlings an advantage over slow growing, shade-tolerant species, yet not enough light to enable the growth of fast growing, shade-intolerant species. Shade from the remaining canopy trees will also lower soil and air temperatures, and reduce moisture loss from the soil and leaf surfaces. A shelterwood harvest may provide advantages over a clearcut by improving aesthetics and increasing mast for wildlife as well (Dey and Parker 1996).

Carefully planned shelterwood harvests have the potential to produce desirable results, even when not coupled with enrichment planting (Fig. 1). Shelterwood harvest strategies are most successful for regenerating oaks when there are already adequate numbers of well-established oak seedlings to fully re-stock the stand after harvest. These well-established seedlings, along with stump sprouts of desirable species, are referred to by foresters as "advance regeneration". Remaining shelterwood trees may also provide extra seed for continued seedling establishment over the next few years, once their canopies respond to the increase in light levels (Johnson et al. 2002).

Enrichment planting beneath shelterwood harvests typically increases the probability of success on sites where the desired species may not have adequate advanced regeneration to fully re-stock the stand. Enrichment planting will ensure that some seedlings will be in a large enough size-class to out-compete surrounding vegetation. Enrichment planting may be done throughout the treated stand or just in areas where advance oak regeneration or potential stump sprouts are insufficient.

After the desired species have become adequately established in the sheltered understory, residual shelter trees are removed and the next generation of forest is released to grow in full sunlight. To decide on the timing of removal, one must evaluate the regenerating seedlings' ability to compete upon release, as well as the species the seedlings will have to compete with for growing space. It is important during this period to monitor the stand's development to ensure that competing species do not overtake the crop species. It may be necessary to implement further weed control methods if such a scenario arises.

Group Selection Harvest

Group selection harvests are often preferred to clearcutting or shelterwood harvests for aesthetic reasons. Group selection harvest openings range from 0.1 to 0.6 acres in size. They are used to favor reproduction of intolerant and mid-tolerant species. Opening size controls light within the opening, but aspect, slope gradient, and surrounding tree heights also influence the amount of solar radiation available to regenerating stems. The minimum distance across the middle of a group selection opening should be one to two tree heights, as a general rule (Johnson et al. 2002). Maximum opening size should entail consideration of light availability, aesthetic concerns, and resultant edge effects including development of epicormic branching on edge trees, seed dispersal distances, animal browse damage or predation from edge species, or effects on breeding birds (Johnson et al. 2002). Group selection harvesting is widely employed by foresters in the Central Hardwood Region to regenerate portions of stands. If properly applied, oak can be regenerated. However, in common practice, group selection harvests often do not result in oak-dominated stands.

Although oak seedlings established after harvest may contribute to future stand stocking (Loewenstein and Golden 1995), it is prudent to ensure adequate stocking from advance regeneration, stump sprouting, and tree planting before the harvest. Jacobs et al. (2006) indicated little variation in northern red oak seedling establishment success upon planting various stock types in 0.25 to 0.99 acre openings after two growing seasons, but they observed increased yellow-poplar regeneration in the openings; thus, indicating the importance of controlling competing vegetation in these openings.

The Process: Assessment → Harvest → Site Preparation → Planting → Maintenance

Several authors have investigated and given recommendations for enrichment planting of oaks in the Central Hardwood Region of the United States (Johnson et al. 1986; Weigel and Johnson 1998; Wishard et al. 1999; Spetich et al. 2004). These studies resulted in varying degrees of success depending upon site quality, natural regeneration potential, competing vegetation, and planting method. These results indicate that management prescriptions will vary by site and species, however, much of the literature is in agreement with the following general guidelines. The rigorous application of these steps will enhance the prospects for successful regeneration of oak stands: 1) assess site quality, existing and potential natural regeneration, competing vegetation, and deer damage potential; 2) correctly apply an appropriate silvicultural method through a well-marked and executed timber harvest; 3) prepare the site for the establishment and growth of the regeneration

through the post-harvest timber stand improvement and vegetation control; 4) plant appropriate planting stock using correct planting methods and technique; 5) maintain the enrichment planting through vegetation and pest control.

Assessment

Site quality. Before prescribing any silvicultural operation, it is necessary to assess the quality of the site. Site quality may be evaluated by examining soil type, topographical factors (aspect, slope, and slope position), or more informal methods such as observing current vegetative composition and growth. Enrichment planted oaks will have a greater chance of success on sites with poor to good productivity rather than highly productive sites where competition will be heavy. Spetich et al. (2004) suggested a site index range of 60 to 79 feet (base age 50) when planting northern red oak. Planting sites of higher quality requires controlling competing vegetation. Competing species can grow much faster than oak seedlings on these sites. Very poor sites, however, may not provide sufficient resources (e.g. water and nutrients) to allow for adequate growth and survival of planted seedlings.

Figure 2. *Surveying potential for advanced oak regeneration below a mature oak stand before shelterwood harvest. (Photo courtesy of Amy L. Ross-Davis)*

Natural regeneration. The ability of an existing stand to naturally regenerate to oak should be evaluated prior to deciding to conduct an enrichment planting. Where feasible, foresters and land managers should plan timber harvests in conjunction with a good acorn crop year to encourage the establishment of oak seedlings. Natural regeneration potential may be assessed by surveying the amount, size, and distribution of advance regeneration and stump sprouting potential of crop species (Fig. 2). Foresters have developed methods for assessing regeneration potential.

Approximately 400 advance oak seedlings should be present at the time of overstory removal or final harvest. This number may decrease somewhat with the presence of potential stump sprouts. For oak seedlings to be considered "advance" regeneration, they must measure at least 3 to 4.5 feet tall or at least ¾ inch in root collar diameter. Oak seedlings of these dimensions have well-developed root systems making them more capable of competing with other fast-growing species in full sunlight. Stump sprouting potential is generally dependent upon the age, diameter, and species of the harvested tree. A stump's probability of sprouting and the competitive ability of the sprouts decrease with tree age and diameter (Weigel and Peng 2002). Table 1 indicates the probability of stump sprouting of common oak species based on size class. Where adequate advance oak regeneration exists, enrichment planting may not be necessary to ensure that the new stand will be dominated by oak.

Table 1. *Probability of stump sprouting of harvested parent trees based on diameter at breast height (DBH).*[1]

DBH size class (inches)	Black Oak	Scarlet Oak	Northern Red Oak	White Oak	Chestnut Oak
2-5	85	100	100	80	100
6-11	65	85	60	50	90
12-16	20	50	45	15	75
17+	5	20	30	0	50

[1]*Adapted from Sander et al. (1976).*

Competing vegetation. The existing or potential understory competition within the planting area should be assessed. A general competition survey should consider size and species of any undesired vegetation currently in the stand's understory. Sugar maple, red maple, American beech, flowering dogwood (*Cornus florida* L.), and white ash (*Fraxinus americana* L.) are common understory competitors in the Central Hardwood Region (Fig. 3). Foresters and landowners should also consider species currently in the forest canopy, as these trees likely contribute to the stored seed source within the forest floor, and may also produce strong

Figure 3. *Advanced regeneration of sugar maple will out-compete planted oak seedlings if not removed. (Photo courtesy of Douglass F. Jacobs)*

competition from stump sprouts if harvested. For example, 1,000 to 10,000 viable yellow-poplar seed per acre may blow up to 100 to 500 feet via the wind to colonize recent or future harvest areas. Many of these seeds remain viable in the soil for 4 to 7 years (Beck 1990). Since oak seedlings are slow growing, much of the competition in the understory will need to be controlled and prevented to help ensure success.

Deer damage potential. Oak buds and twigs are a preferred browse food for deer. Large deer herds effectively eliminate oak regeneration and damage regeneration of other desirable species. Deer damage potential should be assessed. The greater the deer browse pressure, the more well-established advance oak seedlings and saplings are required to successfully regenerate the stand to oak, or the greater the need to implement measures to protect the regeneration or reduce the deer herd.

Harvest

When possible, the initial harvest in a shelterwood should be conducted following a year of good acorn production to encourage the growth of naturally regenerating seedlings. This first harvest should reduce overstory density to 60 to 80 % stocking (Weigel and Johnson 2000; Johnson et al. 2002). This provides adequate light for oak seedling establishment, but sufficient shade to inhibit the establishment of yellow-poplar and the rapid re-establishment of the understory. The amount of overstory removal will be dependent upon site quality and the amount and type of competing vegetation in the understory. The stand should be thinned from below by removing understory and some intermediate crown class trees down to a diameter of 1.5 inches (Fig. 4). Trees should be selected for removal based upon form, species, and desirability of neighboring trees. Poorly formed, diseased, stressed trees, and less desirable species should first be selected for removal in the harvest. Better quality trees will also be marked for harvest to achieve the desired shelterwood light conditions and to make the lot of timber saleable. In a group selection harvest, all overstory trees will be removed in the harvest.

Site Preparation

All non-merchantable trees in the understory should be cut down or otherwise killed in the post-harvest timber stand improvement, down to less than 1.5 inches in diameter, but taller than 1 foot. Herbicide should be applied to the stump surface of undesirable species to prevent stump sprouting (Spetich et al. 2004). Herbicide should not be applied to oak stumps. Grapevines and noxious or invasive weeds should be controlled prior to harvest. If harvest timing coincides with a good acorn crop, scarifying the soil by light disking or raking immediately following acorn drop, but before the timber harvest, may improve oak seedling establishment (Lhotka and Zaczek 2003). Broadcast applications of foliar applied herbicides prior to planting will further reduce weed competition (Wright 1985). The use of broadcast herbicide applications, however, should be weighed against the potential damage to and need to conserve native plant communities. An alternative is to identify tree planting spots first and then make spot applications of herbicide in a 2 feet radius (circle) at each planting spot.

Figure 4. *Initial harvest of mature overstory and removal of competing understory. (Photo courtesy of Douglass F. Jacobs)*

Planting

The future stocking and density (trees per acre) of the stand is dependent on the number of oak seedlings planted, the amount of natural advance oak regeneration already present, and the number of oak seedlings that become established from seed. Stocking level recommendations will vary depending upon individual landowner objectives and future management objectives. Spacing between planted seedlings will depend upon final stocking goals, and abundance and distribution of established oak regeneration. Ultimately, it will be up to the landowner or forester to decide what stocking level will meet the future goals of the stand, but it is recommended that 150 to 385 oak stems of at least 4.5 feet in height be established per acre at the time of overstory removal (Desmarais 1998). Alternatively, enrichment planting can be targeted to those areas lacking advance oak regeneration or sprout potential, thus reducing planting costs.

It will be critical to choose the right seedling stock. Seedlings should be obtained from a local nursery that uses a native seed source (Jacobs 2003). Because of intense competition, seedlings planted in a shelterwood, clearcut, or group selection opening need to be larger than what might normally be planted in other settings. Bare-root hardwood seedlings should have at least a shoot height of 18 inches, a root collar (the part of the root just below ground level) of at least ¼-inch thick, preferably ½ inch or larger (Johnson et al. 2002). Seedling shoots should be balanced with their roots

Figure 5. *Bareroot northern red oak seedlings. (Photo courtesy of Douglass F. Jacobs)*

(Fig. 5). Larger seedlings with greater size root collars are needed when no site preparation or weed control will be used or where site quality is high and yellow-poplar competition is present (Fig. 6). Smaller seedlings should be culled and not planted. Seedling and planting costs are also important considerations. It is better to pay more for high quality seedlings rather than risk planting failure with less expensive, poor quality seedlings. Seedling quality will have a large bearing on the success of the enrichment planting operation and future timber quality (Pijut 2003).

Follow best management practices when transporting, storing, and handling seedlings (Pijut 2003). Removing seedling tops 6 to 8 inches above the root collar before planting tends to improve seedling performance when planted under shelterwoods (Johnson et al. 2002).

Seedlings should be planted in late winter to early spring when seedlings are still dormant. The hand planting of large planting stock can be challenging work, so it is vital to use a competent planting crew. Mechanized planting options for large planting stock include a hand auger with a 2-cycle engine power

Figure 6. *Large container oak seedlings can be expensive, but should provide better survival and growth after planting. (Photo courtesy of Douglass F. Jacobs)*

head and tracked skid steer or tractor with an auger attachment. All of the proper tree planting protocols must be followed by the crews, and supervisors must ensure prevention of desiccation and mechanical damage to the roots during the planting operation (Pijut 2003).

Maintenance

Monitoring. Once the seedlings have been planted, it is recommended that periodic survival checks are conducted to ensure seedling survival and evaluate other maintenance needs to ensure their success (Fig. 7). Seedlings should be monitored following the first two growing seasons (WDNR 2006). The presence of insects, disease, or animal damage, and occurrence of competing vegetation should also be noted. The 2nd or 3rd year following timber harvest in a group selection

Figure 7. *Seedlings should be periodically checked for growth, survival, and overall health. (Photo courtesy of Anthony S. Davis)*

opening and in shelterwoods with low residual overstory stocking, the vegetation becomes too thick to continue monitoring. The window of opportunity to correct problems also quickly closes after the 3rd growing season.

Animal browse. Animal browse from rabbits, voles, moles, and most especially deer in the Midwest can damage or destroy newly planted seedlings. Many methods of prevention are available though they differ greatly in terms of their cost and effectiveness. Various designs of tree protectors, shelters, and fencing schemes, plus a variety of repellents have been developed and tried with varying degrees of success. The most efficient way to control deer damage is through adequate hunting pressure. McKenna and Woeste (2004) discuss animal damage control in greater detail.

Weed control. Even with careful planning and proper implementation, it is still possible that competing vegetation may overtake planted and naturally regenerating seedlings. Yellow-poplar can be a very aggressive competitor on good sites upon

Figure 8. *Yellow-poplar regeneration after initial harvest may be extensive and grow quickly. (Photo courtesy of Douglass F. Jacobs)*

the release cutting (Fig. 8). In these situations, it will be necessary to apply weed control to the competing vegetation. Because of limited access and irregular spacing of desirable species, competing vegetation is commonly treated with directed foliar applications of post-emergent herbicides. This is most effectively accomplished with a backpack sprayer and hand-wand. When applying herbicides it will be necessary to shield desired seedlings from overspray.

Where herbicides are not an acceptable method for competition control, alternatives include mechanical vegetation control and prescribed burning. Mechanical vegetation control includes mowing, scarification of the forest floor, and clearing understory vegetation with a small bulldozer or tractor prior to planting seedlings, or cutting stems of competing vegetation. Alternatively, prescribed fire conducted under low-risk conditions may prove to be a cost-effective form of weed control. Well-timed burns kill and weaken competing regeneration (Fig. 9). While oak seedling tops are killed by fire, the roots and buds at the root collar survive and re-sprout vigorously. Because it is beneficial to oak regeneration only under very specific conditions and because of the inherent risks associated with its use and the need to comply with local air quality standards, controlled burning should

Figure 9. *Low intensity prescribed burn should only be conducted with professional supervision. (Terry Price, Georgia Forestry Commission. Reproduced with permission, www.forestryimages.org)*

only be done under the supervision of qualified personnel.

Release. Once an adequate number of desired trees have become well established, the overstory should be removed to release the seedlings. One more herbicide application made prior to overstory removal helps reduce the competition for the planted seedlings upon release. The final removal is dependent upon the status of the regeneration in the understory, and may be done some time between 3 and 10 years after the initial harvest (Sander and Graney 1993; Spetich et al. 2004). This time frame should allow for planted seedlings to overcome planting shock and obtain a competitive advantage over controlled vegetation (Fig. 10). Once the overstory removal is complete, any leftover stumps or cut stems from undesirable species should be sprayed with an herbicide to prevent re-sprouting.

Summary

Many factors contribute to the success or failure of an enrichment planting operation, but several studies have shown good seedling survival rates using the basic methods described above. For example, after 2 years Dey and Parker (1997) showed a 99 % survival rate among planted northern red oaks in a shelterwood enrichment planting study, where 50 % of the overstory crown density was removed. Weigel and Johnson (1998) found a 98 % survival rate in planted northern red oaks following the first growing season after

Figure 10. *Release of oak sapling after removal of overstory. (Photo courtesy of Douglass F. Jacobs)*

reducing overstory density by 60 % stocking. Thirteen growing seasons after planting, survival rates ranged between 50 and 77 % depending upon the specific treatment.

There are many costs and benefits that must be weighed before deciding whether to do enrichment planting; how much to plant and what seedlings to use. Controlling competition from other species is a necessary associated cost. Alternative regeneration methods, such as clearcutting, are cheaper and easier to plan and execute, but the probability of regenerating an oak dominated stand on medium to good productivity sites is low. By controlling the regeneration of the future stand, a landowner may better realize his or her objectives. Although enrichment planting can be costly, when properly implemented it helps ensure that oak will be a prominent component of the new stand.

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FNR-225

A Landowner's Guide to
Sustainable Forestry
in Indiana

Part 7. Managing for a Diversity of Value-Added Forest Products

Ron Rathfon, Extension Forester, Department of Forestry and Natural Resources, Purdue University

Most landowners may immediately think of timber when considering income opportunities from their woodland. Historically, timber has certainly been the most important income-generating forest resource. Other emerging markets, however, are expanding your income potential. The list of alternative income opportunities is long. An exhaustive treatment of the possibilities is beyond the scope of this publication. However, a few of the more popular alternative enterprises are highlighted below.

Forest Herbs

Ginseng, a native herb at home on the floor of densely shaded hardwood forests in Indiana, has been exported from North America to Asia since the 18th century (Beyfuss 1999a). It, along with other native forest herbs like goldenseal (yellow root), is growing in popularity in North America and Europe as a medicinal and dietary supplement.

Richard Myers

Ginseng was exported from North America to Asia as early as the 18th century. It remains a valuable export commodity today.

Collecting forest herbs from the wild for later sale on the botanicals market is referred to as wild-crafting. Although generations of rural folks have relied on wild-crafting for supplemental income, many conservationists fear certain species of forest herbs are becoming scarce as a result of over-harvesting. State and federal statutes regulate the harvest and sale of wild ginseng. Seasons and collection rules must be carefully adhered to and dealers purchasing wild ginseng must be licensed. Indiana DNR, Division of Nature Preserves, can provide you with more information on state laws governing the harvest of wild ginseng.

Your forest may provide an ideal environment for cultivating forest herbs. Much research and experience has gone into current ginseng cultivation guidelines.

Pawpaw fruit, long revered as the "Indiana banana," is finding its way into ice cream shops, bakeries, and on to the menu of 4-star hotels. Pawpaw leaves, twigs, and bark contain compounds that may prove useful for controlling cancer and as insecticides, creating new markets for this humble, low-growing native of Indiana.

Ron Rathfon

www.pawpaw.kysu.edu

Many other forest herbs are not as well researched. There are three generally recognized methods of cultivating ginseng:

1. Field cultivated – grown in raised beds in open fields under shade cloth or other partial shade, usually with irrigation and fertilization.
2. Woods cultivated – grown in tilled beds in the forest, with weeding and thinning.
3. Wild simulated – grown in untilled soil in the forest, without irrigation, fertilization, weeding, or thinning. Takes longer to grow to harvest size than previous two methods but closely resembles true wild ginseng.

Field cultivation of ginseng is currently not profitable for someone just entering the market. Woods cultivated can bring 2.5 to 10 times and wild simulated can bring 20 to 30 times the price paid for field cultivated ginseng roots. True wild ginseng roots command the highest price per pound, recently bringing $350 to $600 per pound-dry weight or 35 to 60 times the price paid for field cultivated ginseng (Beyfuss 1999b). There are many other sources of information on the cultivation of

ginseng and other forest herbs. Your county Cooperative Extension Service can direct you to more sources of information.

Mushrooms

Gourmet mushrooms like shiitake and oyster are now found in the produce sections of larger grocery stores and are being added to the menus of upscale restaurants. Forest production of mushrooms usually involves inoculating logs of specified species and dimension with fungal spawn. These fungi are decomposers, that feed on the wood and eventually rot it.

Logs 5- to 8-inches in diameter are ideal for growing mushrooms. This size log can be readily obtained during thinning and timber stand improvement work and from the tops of felled trees following logging. If you want to grow mushrooms for personal use or to share with your friends and neighbors, 10 to 15 logs, four feet in length, should be sufficient. If you want to supply a limited number of local supermarkets, farmer's markets, or natural foods stores, 200 to 500 logs may be needed. Major suppliers require thousands of logs to be in production at one time (Hill 1999). Contact your county Cooperative Extension office to find out more.

Deborah Hill

Shiitake mushroom cultivation is a good way to utilize small diameter logs left after logging or cut during timber stand improvement work.

Develop the Recreation Potential of Your Forest

Most forest owners enjoy recreating on their property. Research shows that 23% of forest land owned by private individuals in the United States is available for public recreational use. Another 45% is open only to people personally acquainted with the owners (National Research Council 1998).

You may feel comfortable inviting friends and family to recreate in your forest. Because of liability and privacy concerns, particularly if you live on your property, you may be less inclined to open your land to the general public. The choice is yours. Under Indiana law you may restrict public access to your land.

There is growing demand for outdoor recreation opportunities. In some regions, public lands and recreation facilities are overused. Outdoor recreation provides you with additional income producing opportunities. Nature-based tourism is the most rapidly growing sector of the tourism market, averaging a 30% annual increase since 1987 (Wissing 1999). A new breed of tourist is emerging that seeks authentic, quality experiences in a natural environment. In the United States, nature tourists spend $7.5 billion annually on travel (Wissing 1999).

Alternative and Value-Added Forest Products

Here is a short list of possible alternative forest products that could be developed into a money-making business.

- Mushrooms - shiitake, oyster, stropharia
- Aromatics - cedar oil
- Fruits and Nuts - persimmons, pawpaw, black walnuts, chokecherry, elderberry, hickory nuts.
- Tree, Shrub, and Herb Seed - for sale to nurseries
- Custom Sawmilling
- Custom "Light-on-the-Land" Logging
- Specialty Wood Products for craft and other niche markets
- Shavings, Excelsior, Sawdust, Bark — for animal bedding and mulch
- Decorative Wood Burls, Spalted Maple, Figured Crotch and Root Crown Wood
- Flavor Wood for Grilling - hickory, beech, apple
- Medicinals - ginseng, goldenseal, cohosh, sassafras, witch hazel, bloodroot, and more
- Floral Products - grapevine, bittersweet, moss, ferns, decorative cut branches
- Maple Syrup
- Baskets - splint and willow twig
- Nature-based Tourism
- Lease Hunting
- Christmas Trees, Roping, and Garlands

Ron Rathfon

Well-planned, -constructed, and -maintained trails are essential to a forest recreation enterprise.

Nature-based Tourism

A new breed of tourist is emerging that seeks authentic, quality experiences in a natural environment. Here is a list of possible nature-based tourism enterprises. You're only limited by your imagination.

- Educational vacations - history, nature, photography.
- Accommodations - campgrounds, cabins, bed and breakfast, elderhostel.
- Guided nature, historical, hiking, canoeing, caving, bird watching, and fishing tours.
- Dude ranch.
- Hunting preserve.
- Canoe livery.

Try combining several ideas to make an attractive vacation package.

Lease hunting, hunting camps, guide services, and hunting preserves are examples of how forest landowners can capitalize on public demand for hunting and fishing opportunities. Many farmers have turned to lease hunting as an extra source of income.

You can take advantage of natural features of your property and combine those with complimentary accommodations and authentic, educational activities to create a unique tourist experience. Carefully research the nature-based and agri-tourism markets in your region. Measure demand and if possible avoid direct competition with other enterprises and public recreation facilities. Find a niche that allows you to partner with other local nature-based tourist attractions, instead of competing directly with them. Nature-based and agricultural-based tourism enterprises are an important rural development opportunity that many communities don't recognize or know how to develop.

Nature-based tourism enterprises need to protect the integrity of the forest. Soil compaction, tree root damage, and severe soil erosion on trails can occur under heavy foot, trail bike, all-terrain vehicle (ATV), and horse traffic. If forest health and wildlife habitat decline as a result of overuse or inappropriate recreational uses, your forest is no longer sustainable.

You should also carefully consider liability, labor needs, advertising, and how opening your land to the public may affect your private and family life. Contact your local county Cooperative Extension Service for help in finding sources of information and services in this growing field.

Ron Rathfon

Christmas Trees and Greenery

Growing Christmas trees and Christmas greenery has been a popular alternative income producer for landowners in Indiana. Christmas trees offer a number of advantages:

- Require low capital investment.
- Have relatively short time period for return on investment (6 to 9 years).
- Can be grown on marginal and sloping farm ground with minimal fertilization.
- Can be grown economically on small acreage.

Christmas Tree Production Information:

Indiana Christmas Tree Growers' Association

8650 N. C.R. 100 E.
Springport, IN 47386
(765) 755-3345
www.indianachristmastree.com

National Christmas Tree Association

1000 Executive Parkway, Suite 220
St. Louis, MO 63141-6372
(314) 205-0944
www.realchristmastrees.org/about.html

Many landowners start Christmas tree farms without fully understanding the intensive, ongoing maintenance they require; e.g., annual weed control, annual shearing, mowing, and final preparation for market. Of those that manage to keep up with Christmas tree maintenance, there are some who have difficulty marketing their trees because of lack of business skills or failure to do good business planning. Many fine-looking pine plantations started out as Christmas tree farms.

Competition from big Christmas tree producers in other states has held down wholesale tree prices in recent years, making wholesale production for small landowners unprofitable. Niche markets in the retail sector remain for enterprising, creative Christmas tree growers. Purdue Cooperative Extension Publication FNR-118, *Growing Christmas Trees in Indiana*, provides more information.

Maple Syrup

Folks who have tasted real maple syrup on their pancakes know what a delectable treat it is. Most people think of Vermont when they think of maple syrup. Many people don't realize that maple syrup is also produced here in Indiana.

Indiana has a significant sugar maple tree resource. Sugar maple is valued for its wood in furniture, trim, flooring, and cabinet manufacturing. Tapping maple trees for syrup production reduces their timber value. Some landowners, however, are adding value to their forest resource and generating annual income by producing and marketing maple syrup and sugar products.

Maple Syrup Production Information:

North American Maple Syrup Producers Manual, M.R. Koelling and R.B. Heiligmann (editors), Ohio State Extension Bulletin 856.

Order from:

Ohio State University Extension
Media Distribution
385 Kottman Hall
2021 Coffey Road
Columbus, OH 43210-1044
(614) 292-1607
pubs@postoffice.ag.ohio-state.edu

Online Version:
http://ohioline.osu.edu/b856/

Indiana Maple Syrup Association
7773 S. 100 E.
Lynn, IN 47355
(765) 874-2170

Tapping the sweet sap of the sugar maple and its close cousin, the black maple, evolved from Native Americans inserting a hollowed elderberry branch into a tap hole in the trunk of a tree. Today, large producers connect trees directly to the sugarhouse with plastic tubing and vacuum pumps. Once in the sugarhouse, much of the water in the sap is evaporated to make a thick, sweet syrup. Forty or more gallons of tree sap are needed to produce one gallon of syrup. A gallon of syrup retails for around $30 in Indiana. More than 90% of maple syrup produced in Indiana is sold retail.

The North American Maple Syrup Producers Manual (Ohio State University Cooperative Extension Service Bulletin 856) is a valuable guide to all aspects of maple syrup production; from how to manage and care for the trees to marketing the final product.

Some maple syrup producers still collect sap "the old fashion" way, with buckets. Many large producers directly connect trees to sugar house with plastic tubing and pumps.

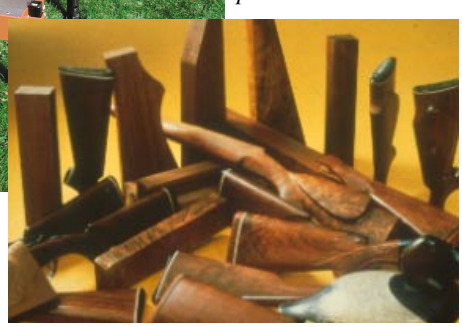
Value-added Wood

Many Indiana communities are richly endowed with forests. Most have not yet realized the value-added opportunities of their forest resources, nor have they figured out how to keep those forest resource dollars in the community.

Landowners sell standing trees to timber buyers. Buyers of timber may come from outside the community,

Courtesy Woodmizer Products, Inc.

"Personal scale" band mills allow do-it-yourselfers to custom cut wood to fill niche markets not directly serviced by larger sawmills. Small band mill operators have the opportunity to convert logging residue into value-added wood products.



Ron Rathjon

Robert Mayer

Weekend loggers have a wide array of small scale logging equipment to choose from.

sometimes from outside the state, or even from another country. Timber is part of the global economy. Buyers of standing timber most often sell logs to sawmills and veneer mills located in another county or even state, and make a profit. The mills make lumber and veneer and sell it for a profit to furniture and cabinet manufacturers, again usually outside the county from where the wood originated. This is not to suggest that you should sell your timber only to timber buyers and mills within your own community. Competition and global markets handsomely reward astute forest landowners with good timber prices.

The advent of the "personal scale" sawmill allows the do-it-yourselfer to custom manufacture lumber for local furniture and cabinet manufacturers and other niche markets. Small dry kilns can be constructed or purchased to add further value to the product. Local farmers, craftsmen, and other wood users also find a local, affordable source of lumber. Custom sawing lumber adds value to the wood and keeps some of those timber dollars circulating within your community instead of waving good-bye to them as they cross the county line on the bed of a log truck.

Even logging has become more personalized. Farm tractors can now be readily converted into small-scale log skidders for the home, weekend logger. You can purchase durable small-scale logging winches that attach to a farm tractor's three-point hitch and operate off of the power take off (PTO). Small forwarders scaled and fitted for use with farm tractors include a log trailer and a boom grapple loader. The advantages of doing your own logging using this small-scale equipment include:

- low capital investment and operating costs;
- potential to earn higher net revenue from log sales than from selling standing trees, assuming you know how to market the logs;
- greater maneuverability in dense stands than standard logging equipment, therefore, causing less damage to remaining trees;
- less soil compaction and disturbance;
- ability to efficiently log small amounts of timber where professional logging crews cannot economically justify it;
- ability to salvage dead and dying timber that would otherwise rot;
- ability to accomplish forest management and wildlife habitat improvement and have it pay for itself through the sale of otherwise unmarketable timber;
- ability to provide wood for personal use;
- personal satisfaction and therapeutic value of doing your own work.

Logging Training Information:

IDNR, Division of Forestry
402 W. Washington St., Rm. W296
Indianapolis, IN 46204
(317) 232-4105
www.state.in.us/dnr/forestry/

Indiana Forest Industry Council
3600 Woodview Trace, Suite 305
Indianapolis, IN 46268
(800) 640-4452
www.fnr.purdue.edu/inwood/ific.htm

Doing your own logging is physically hard work. Logging is also the most dangerous occupation in the United States with an accident rate 2.5 times greater than the average for all other industries (Shaffer 1998). You should NOT attempt to do your own logging unless you have been properly trained and understand the risks involved. You should also have all prescribed safety equipment and be committed to using it. Training programs are available through the Indiana Forest Industry Council and Indiana DNR, Division of Forestry.

Doing your own logging also means making extremely important decisions about what trees to cut. Such decisions affect the long-term health of the forest for better or worse. Work with a forester to be sure your logging practices sustain your forest's health and productivity. Part 3 of the *Sustainable Forestry Series*, entitled *Keeping Your Forest Healthy and Productive* (FNR 182), outlines practices that promote forest health and also some practices that harm it. Part 5 of the series, entitled *Forests and Water* (FNR 184), refers to best management practices (BMPs) for logging to prevent soil erosion and water pollution. Part 6, *Maintaining the Aesthetic Beauty and Enhancing the Recreational and Cultural Values of Your Forest* (FNR 185), contains a list of tips for improving the appearance of your logging job.

While cutting and selling timber from your own property does not require state approval, purchasing standing and cut timber from someone else does require a Timber Buyers License. Contact Indiana DNR, Division of Forestry for more information. *Farm Tractor Logging for Woodlot Owners*, a Virginia Cooperative Extension publication, provides more information on doing your own logging and includes a partial equipment manufacturer and dealer list.

Do Your Homework!

Before purchasing specialized equipment or diving headlong into one of these enterprises, do your homework. Carefully analyze the market and your personal and family situation. Starting a new enterprise requires a substantial commitment of your time and often capital. Start small and avoid investing more money into the enterprise than you are willing to lose. Of course, for some folks, it's recreational — making money isn't as important. Many successful businesses start as hobbies, but most hobbies never develop into successful businesses.

The list of additional information sources at the end of this chapter includes publications on starting a small business. The U.S. Small Business Administration has a wealth of information on starting a small business. They have offices in Indiana and maintain a useful Web site at *www.sba.gov*. Contact your County Cooperative Extension office for more information on starting an alternative forest products enterprise.

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A Landowner's Guide to Sustainable Forestry in Indiana

Part 1. *Sustainable Forestry - What Does It Mean for Indiana?—FNR-180*
- Sustainable Forestry Described
- Historical Perspective
- Indiana's Forests Today
- How This Series Is Organized

Part 2. *Planning for the Future—FNR-181*
- The First Step - Who Can Help You?
- Your Objectives
- Gathering Information
- Planning Your Management Activities
- Using Legal Contracts

Part 3. *Keeping Your Forest Healthy and Productive —FNR-182*
- Maintaining and Enhancing Site Productivity
- Improving Tree Growth and Protecting Timber Quality
- Regenerating the Forest

Part 4. *Conserving Nature—FNR-183*
- Provide Wildlife Habitat
- Unusual Habitats
- Endangered Species
- Invaders! Harmful Exotic Species
- Forest Fire - Friend or Foe?
- Fragments of Forests

Part 5. *Forests and Water—FNR-184*
- Livestock
- Reforestation Benefits Water Resources
- Avoid Clearing Forest
- Forest Roads and Trails
- Best Management Practices (BMPs) for Timber Harvesting
- Pesticides
- Protecting Sensitive Water Resources

Part 6. *Maintaining the Beauty and Enhancing the Recreational and Cultural Values of Your Forest—FNR-185*
- Maintain Visual Buffers Next to Public Places
- Maintain Important Scenic Views
- Tips for a Better-Looking Logging Job
- Develop the Recreation Potential of Your Forest
- Protect and Enhance Cultural and Historic Values

Part 7. *Managing for a Diversity of Value-Added Forest Products—FNR-186*
- Forest Herbs
- Mushrooms
- Develop the Recreation Potential of Your Forest
- Christmas Trees and Greenery
- Maple Syrup
- Value-added Wood
- Do Your Homework!

Part 8. *Help!—FNR-187*
- Cost Share Grants
- Classified Forest and Wildlife Habitat Programs
- Leaving a *Forest Legacy* - Permanent Forest Protection Through Conservation Easements
- Tax Incentives and Estate Planning
- Forest Bank
- Forest Cooperatives
- Carbon Sequestration
- Forest Certification
- Education and Technical Assistance

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FNR-403-W

EXPERT REVIEWED

Controlling Moisture Content in Stored Lumber

Daniel L. Cassens, Professor and Extension Wood Products Specialist
Department of Forestry and Natural Resources, Purdue University

Introduction

For most regions of North America, hardwood lumber destined for manufacture into products such as furniture, cabinets, millwork, and others is carefully kiln dried to 6-8 percent moisture content. Once the lumber in kiln dried, it needs to be stored in the appropriate environment of temperature and relative humidity or it will simply regain moisture. If the lumber is then manufactured into a product used in a typical residence or office, it will again loose moisture, shrink and possibly warp, resulting in an unacceptable appearance.

Most commercial lumber producers and users understand this principle of moisture regain in kiln dried lumber. Where lumber is stored for extended periods, the temperature inside the storage area is elevated above the outside temperature, thereby lowering the relative humidity in the storage area. This is standard industry practice. Many smaller woodworkers do not understand moisture regain and, as a result, may improperly store well-dried lumber.

Wood Releases and Gains Moisture

Table 1 presents the equilibrium moisture content (EMC) for temperate wood species for any given temperature and relative humidity. EMC is a technical term. With changing temperature and relative humidity, wood is constantly releasing or gaining moisture. This change occurs slowly. At a set temperature and relative humidity, wood will eventually equilibrate to a certain moisture content or EMC and stay there until environmental conditions change. For example, at 70° F and 35 percent relative humidity, the EMC for wood is 6.9 percent. These are also the conditions that are very comfortable to human beings and typical of conditions in homes and offices.

When summer conditions of 80° F and 80 percent relative humidity develop, the wood EMC increases to 15.7 percent. This does not mean that the lumber will suddenly change to this high moisture content, although with time, it will. Length of time is hard to estimate, but with a few weeks to a month or more, a significant change in moisture content can occur. Another example is a heated house during winter time. Assuming no substantial humidification is occurring, the relative humidity can drop to 20 percent or less and at 70° F, the EMC is 4.5 percent. Again, the change takes time and after a winter of heating, cracks can develop in wood floors, and furniture joints can open.

One board, fully exposed will change moisture content relatively quickly as compared to an entire stack of lumber. Thinner lumber or veneer, reacts faster than thicker stock. Tightly stacked lumber changes moisture content on its periphery first, with the center slower to respond.

Lumber destined for interior application is dried to 6-8 percent moisture content because this moisture content is midway between normal extremes of EMC, and a certain amount of movement one way or the other is acceptable.

Stored Lumber

Properly kiln dried lumber stored inside of a residence where temperature is controlled, will not significantly gain or loose moisture, thus there is little shrinking or swelling. However, if the lumber is stored in a damp basement, unheated garage or other storage area, it will regain moisture. Fortunately, relatively inexpensive instruments (Figure 1) that measure the temperature and relative humidity are available at building supply stores. These instruments can be used to determine if lumber is being stored under the correct environmental conditions. Be sure to keep a fresh battery as a partially depleted battery can give erroneous readings.

Equipment for Monitoring Humidity and Temperature

Relative humidity is somewhat difficult to measure. If possible, any new instrument should be checked against a known standard. The author has compared readings from several inexpensive instruments with laboratory quality equipment. Although readings of relative humidity are not always identical, they are reasonably close.

If the relative humidity is too high in a small lumber storage area, household dehumidification units can be used to lower it. To control costs, it is helpful to store the lumber in an enclosed space so large open areas are not being conditioned. Tightly wrapping veneer and lumber in plastic will also help to maintain the proper moisture content, but even with this method, kiln dried wood will eventually regain moisture.

The moisture content of the lumber at the time of use should also be determined. Many wood workers and even commercial companies try to process lumber as quickly as possible to avoid regain. Unfortunately, this method can be risky and problems such as warping and open joints can develop. Therefore, adequate equipment to monitor temperature and relative humidity should be purchased to determine if the desired conditions are being maintained. If not, corrective action is necessary.

Figure 1. Hand-held temperature and humidity monitoring equipment

Table 1. Equilibrium wood moisture content (EMC) for a given relative humidity and temperature

	Relative Humidity															
	20	**25**	**30**	**35**	**40**	**45**	**50**	**55**	**60**	**65**	**70**	**75**	**80**	**85**	**90**	**95**
°F	----------Wood Moisture Content (percent)----------															
30	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.4	11.3	12.4	13.5	14.9	16.5	18.5	21.0	24.3
40	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.4	11.3	12.3	13.5	14.9	16.5	18.5	21.0	24.3
50	4.6	5.5	6.3	7.1	7.9	8.7	9.5	10.3	11.2	12.3	13.4	14.8	16.4	18.4	20.9	24.3
60	4.6	5.4	6.2	7.0	7.8	8.6	9.4	10.2	11.1	12.1	13.3	14.6	16.2	18.2	20.7	24.1
70	4.5	5.4	6.2	6.9	7.7	8.5	9.2	10.1	11.0	12.0	13.1	14.4	16.0	17.9	20.5	23.9
80	4.4	5.3	6.1	6.8	7.6	8.3	9.1	9.9	10.8	11.7	12.9	14.2	15.7	17.7	20.2	23.6
90	4.3	5.1	5.9	6.7	7.4	8.1	8.9	9.7	10.5	11.5	12.6	13.9	15.4	17.3	19.8	23.3
100	4.2	5.0	5.8	6.5	7.2	7.9	8.7	9.5	10.3	11.2	12.3	13.6	15.1	17.0	19.5	22.9
110	4.0	4.9	5.6	6.3	7.0	7.7	8.4	9.2	10.0	11.0	12.0	13.2	14.7	16.6	19.1	22.4
120	3.9	4.7	5.4	6.1	6.8	7.5	8.2	8.9	9.7	10.6	11.7	12.9	14.4	16.2	18.6	22.0
130	3.7	4.5	5.2	5.9	6.6	7.2	7.9	8.7	9.4	10.3	11.3	12.5	14.0	15.8	18.2	21.5
140	3.6	4.3	5.0	5.7	6.3	7.0	7.7	8.4	9.1	10.0	11.0	12.1	13.6	15.3	17.7	21.0
150	3.4	4.1	4.8	5.5	6.1	6.7	7.4	8.1	8.8	9.7	10.6	11.8	13.1	14.9	17.2	20.4
160	3.2	3.9	4.6	5.2	5.8	6.4	7.1	7.8	8.5	9.3	10.3	11.4	12.7	14.4	16.7	19.9

The equilibrium moisture content (EMC) of wood is that moisture content which wood will eventually equalize to given a fixed temperature and relative humidity. If the temperature and relative humidity change the moisture content of the wood will change.

Source: Wood Handbook www.fpl.fs.fed.us

Notes

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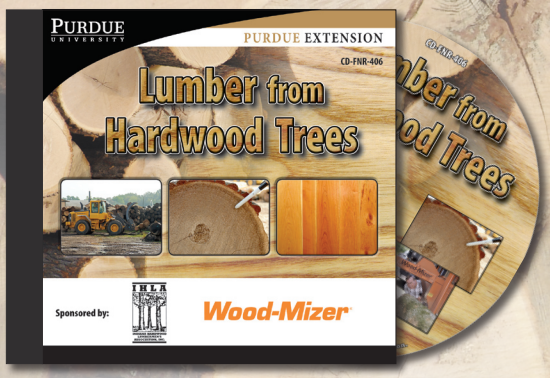
Lumber from Hardwood Trees

New!



Lumber from Hardwood Trees CD

Department of Forestry and Natural Resources

Enjoy over 30 years of knowledge with Dan Cassens, Professor of Forestry and Natural Resources, Purdue University, on 35 of the nation's popular hardwood trees. Whether you are weekend wood craftsman or seasoned sawmill operator, this CD will be your resource of hardwood tree information!

This Comprehensive CD on hardwoods covers the following:

- Commercial Species: Ash; Aspen; Basswood; Beech; Birch; Black Cherry; Black Walnut; Cottonwood; Hackberry; Hard or Sugar Maple; Hickory; Red Oak; Sassafras; Soft Maple; Sycamore; White Oak; Yellow-Popular
- Other Species: Black Gum; Black Locust; Boxelder; Buckeye; Butternut; Catalpa; Chestnut; Coffeetree; Dogwood; Elm; Holly; Honey Locust; Magnolia; Mulberry; Osage Orange; Persimmon; Sweetgum; Willow
- Decay Resistance: Learn the decay properties of various hardwood species.
- Mechanical Properties: Learn about different properties of various hardwood species.
- The Production Process: See how hardwood lumber is processed from start to finish.
- Purchasing and Selling Hardwood Lumber: Learn who to contact when you are buying or selling lumber.
- Shrinkage: Learn how much lumber can shrink and expand due to relative humidities.
- Steam Bending: Learn how different hardwood lumbers respond to various bending techniques.
- Understanding Lumber: Learn different characteristics of hardwood lumber, terms and definitions, and sawing techniques.
- Wood Machining: Find out how different hardwood species respond to planing, shaping, turning, and boring.

This CD is dedicated to the thousands of companies and individuals Dan has met and shared knowledge with at numerous events and workshops over the years.

Order your new *Lumber from Hardwood Trees* CD today!

Visit our Web site @ www.extension.purdue/edu/LumberfromHardwoods

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Checkout out all the other Forestry & Natural Resources information at The Education Store.

- Black Walnut Information- 3 publications- 1 Free on Web
- Forestry Management- 46 publications- 4 Free on Web
- Furniture Manufacturing- 8 Publications- 3 Free on Web
- General Forestry- 7 Publications- 6 Free on Web
- Hardwood Log, Lumber and Veneer Manufacturing- 17 Publications- 5 Free on Web
- Hardwood Lumber and Veneer Species- 26 Publications- All Free on Web
- Timber Marketing- 10 Publications- 4 Free on Web
- Much more...
- **Visit www.extension.purdue.edu/extmedia/fnr.htm**

Hardwood Lumber of the Central Midwest Order Form

Quantity	Product Number	Title	Unit Price	Total
	CD-FNR-406	*Lumber from Hardwood Trees* CD	$25.00	

Prices are subject to change

Subtotal	
Shipping*	
Tax-exempt number	
Indiana residents 7% sales tax	
TOTAL	

For orders placed outside the 48 continental United States, contact us for shipping information.

Send completed form to:

Purdue Extension
The Education Store
231 S. University St.
West Lafayette, IN 47907-2094

1-888-EXT-INFO (398-4636)
Phone: (765) 494-6794
Fax: (765) 496-1540
E-mail: media.order@purdue.edu
Hours: 8 to 5 / Monday – Friday

*** Calculate U.S. Shipping**

Amount of Order	Shipping Charge
Free-$25.00	$3.50
$25.01-$ 99.99	$6.50
$100.00-$299.99	$15.00
$300.00 or more	Actual shipping costs

Customer Shipping Address

(We ship UPS and cannot ship to a Post Office box address.)

Name: _____

Company: _____

Address: _____

City: _____ **State:** _____ **Zip:** _____

Daytime Phone: _____

E-mail: _____

▶ *Thank you for your order!*

❑ Prepay check/money order (U.S. funds)
Payable to: **Purdue University**
(Send order form and payment in a sealed envelope)

Charge your order. It's easy!

❑ MasterCard ❑ VISA ❑ DISCOVER

Card Number: _____

Expiration Date: _____

Cardholder's Name: _____
(Please Print)

Signature: _____

FNR-37

forestry & natural resources

MARKETING AND UTILIZATION

Drying Small Quantities of Hardwood Lumber— Understanding The Effects of Moisture on Wood

by Daniel L. Cassens, Forest Products Marketing and Utilization Specialist

Up to one-half the weight of most freshly cut hardwood lumber is water or sap. Nearly all of this water must be removed before the lumber can be used for many purposes. Simple air drying of lumber does not make it suitable for indoor use. If the wood is not dried prior to its use, it will dry while in service, shrinking and leaving gaps between boards which were originally tight together. Some warping and checking can also result. To minimize these problems, lumber produced commercially is dried in kilns to the average moisture content consistent with that found where the wood will finally be used. Kilns are large, enclosed compartments where the temperature can be elevated, sometimes as high as 240°F, and the humidity can be controlled. Commercial companies will usually not dry small quantities of lumber on a custom basis. As a result, many small woodworking companies and hobbyists frequently have problems locating economical sources of well-dried hardwood lumber.

Other individuals want to use lumber cut from their own supply of trees or logs. In this case, high quality trees suitable for veneer should not be cut for lumber. It may be more economical to harvest lower grade trees or even buy the lumber and then sell the veneer quality trees. This publication will explain the effects that the removal of moisture has on wood and will outline proper air drying procedures. A method for drying small quantities of lumber for indoor use is also given. Commercial companies and individuals who desire further information should consult the references given at the end of this publication.

Moisture Content of Lumber

The moisture content of lumber is a critical factor. Green lumber is heavy and can stain, mold, and even rot if not properly handled. As the moisture content of wood drops below 30 percent, shrinkage begins and can be accompanied by serious defects such as end splitting, surface checking, cupping, bowing, and twisting. Dry wood can also pick up moisture and swell. Therefore, knowing the moisture content of lumber is paramount in understanding how to handle and work with the material.

Table 1 shows the moisture content of freshly cut lumber for some common Indiana species. As can be seen, the moisture varies from a low of 44 percent in the sapwood of white ash to a high of 160 percent in the heartwood of cottonwood. Moisture content can also vary with location in the tree. However, the moisture content does not seem to vary substantially between seasons of the year.

A moisture content of 28 to 30 percent in North American woods is a critical point in lumber drying. This point is called the *fiber saturation point* (FSP). Comparatively large changes result in the physical and mechanical properties of wood as the moisture content drops below this point. Any moisture removed below the FSP is called "bound water" and comes from the cell wall. Therefore, the FSP is the moisture content level at which shrinkage, and thus the potential for warping, checking, and splitting of lumber, begins. Moisture above the FSP is held as "free water" in the cell cavities. Its removal will not affect the shrinkage of

wood. The term FSP pertains to the moisture content of individual cell walls and not to the whole piece of wood. Therefore, when freshly cut lumber begins to check, it does not necessarily mean that the FSP has been reached throughout the piece but rather just for some cells.

The standard method of determining moisture content is called oven-drying, and the moisture content of wood is expressed as a precentage of the oven-dry weight. The oven-dry weight is determined by heating wood at 105°C until a constant weight is reached. The formula used to figure moisture content is:

$$MC = \frac{IW - OD}{OD} \times 100$$

where

MC = moisture content in percent
IW = initial weight of the wood
OD = oven-dry weight of the wood.

Electric moisture meters can also be used to determine the moisture content of wood. Although not as accurate as oven-drying, these devices can give reasonable readings within the range of seven to 25 percent moisture content; however, electric moisture meters are subject to error if not used properly. Less expensive models start at about $150.

Table 1. Moisture content in percent of oven-dry weight for freshly cut wood.

Species	Moisture Content (%) Heartwood	Sapwood
Ash (White)	46	44
Basswood	81	133
Beech	55	72
Cherry	58	—
Cottonwood	160	145
Elm (American)	95	92
Hackberry	61	65
Hickory	71	49
Maple (Silver)	58	97
Maple (Sugar)	65	72
Oak (Red)	80	69
Oak (White)	64	78
Sweetgum	79	137
Sycamore	114	130
Blackgum (Tupelo)	87	115
Walnut	90	73
Yellow-Poplar	83	106

Shrinkage of Wood

Changes in the moisture content of wood below the FSP result in the shrinking and swelling of wood. The species and grain pattern will also have an effect on the amount of shrinkage that occurs. The importance of this dimensional change in wood cannot be overemphasized. As wood dries and shrinks, stresses are set up and then relieved by development of defects such as warping, surface checking, and end splitting. Common problems associated with the shrinking and swelling of wood already in service are evidenced by squeaking wood flooring and sticking doors and windows.

Figure 1 illustrates the grain pattern of lumber as it relates to shrinkage. The reduction in size parallel to the growth rings, or circumferentially, is called *tangential shrinkage*. The reduction in size parallel to the wood rays, or radially, is called *radial shrinkage*. A plain or flatsawed board shrinks tangentially in width or radially in thickness. A quartersawed board shrinks radially in width and tangentially in thickness. Lumber is seldom cut as a perfect plainsawed or quartersawed board. As a result, the expected shrinkage in the width of a board is usually some percentage between those given for radial and tangential shrinkage.

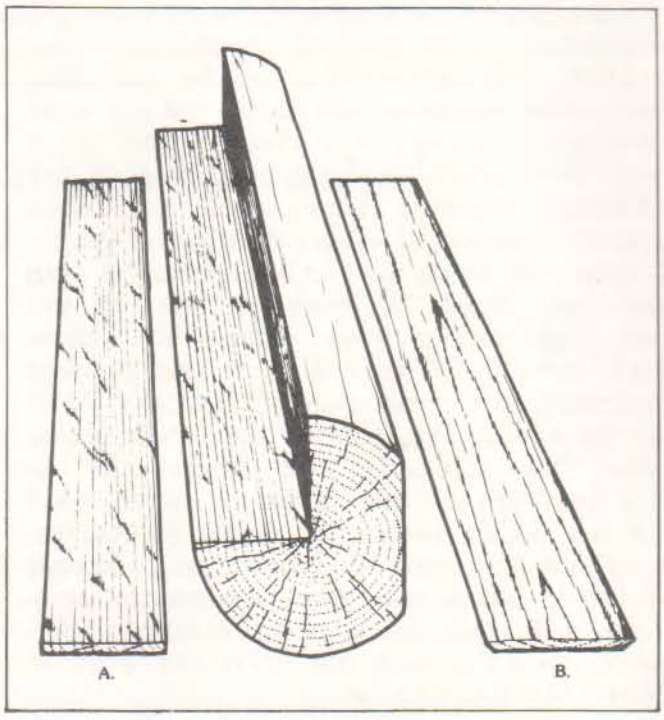


Figure 1. Quartersawed (A) and plainsawed (B) boards cut from a log.

Table 2. Total shrinkage values of common Indiana woods expressed as a percentage of green dimensions.

Species	Shrinkage to 0 percent moisture content		Shrinkage to 6 percent moisture content	
	Radial (%)	Tangential (%)	Radial (%)	Tangential (%)
Ash (White)	4.9	7.8	3.8	6.2
Basswood	6.6	9.3	5.3	7.4
Beech	5.5	11.9	4.1	8.8
Cherry	3.7	7.1	3.0	5.7
Cottonwood	3.9	9.2	3.1	7.4
Elm (American)	4.2	9.5	3.4	7.6
Hackberry	4.8	8.9	3.8	7.1
Hickory	7.4	11.4	5.9	9.1
Maple (Silver)	3.0	7.2	2.4	5.8
Maple (Sugar)	4.8	9.9	3.9	7.6
Oak (Red)	4.0	8.6	3.2	6.6
Oak (White)	5.6	10.5	4.2	7.2
Sweetgum	5.3	10.2	4.2	7.9
Sycamore	5.0	8.4	4.1	6.1
Blackgum (Tupelo)	5.1	8.7	3.5	6.2
Walnut	5.5	7.8	4.4	6.2
Yellow-Poplar	4.6	8.2	3.2	5.7

The longitudinal shrinkage of wood is generally 0.1 to 0.2 percent of the green dimension and is considered insignificant.

Wood species also affects the amount of shrinkage which will occur as wood dries below the FSP. Heavy, hard woods such as hickory or beech generally shrink and swell more than the lightweight woods such as yellow poplar and silver maple. Table 2 gives shrinkage values in the radial and tangential directions for some common hardwoods in drying from green (44-160 percent moisture) to six and zero percent moisture content. Wood with a moisture content of six to eight percent is suitable for indoor use.

The shrinkage values in Table 2 can be converted into useful units of measurement. Each three percent of shrinkage, either radially or tangentially, is roughly equivalent to a decrease in width or thickness of 1/32 inch per inch. For example, the tangential (plainsawed board) shrinkage of white oak from green to six percent moisture content is 7.2 percent (Table 2). Therefore, the shrinkage per inch in width is:

$$\frac{7.2}{3} \times \frac{1}{32} = .08 \text{ inch}$$

Equilibrium Moisture Content

Wood is generally dried to a specific moisture content depending upon its end use. However, wood is a hygroscopic material. Therefore, it constantly picks up or gives off moisture to maintain an equilibrium with the environment. Thus, wood is constantly shrinking or swelling. The amount of moisture which wood will gain or lose depends upon the temperature of the air and the relative humidity. At a constantly maintained temperature and relative humidity, wood will reach an equilibrium where it neither loses nor gains moisture. At this point, wood is said to have reached its *equilibrium moisture content* (EMC). Figure 2 shows the EMC of wood in relation to temperature and relative humidity.

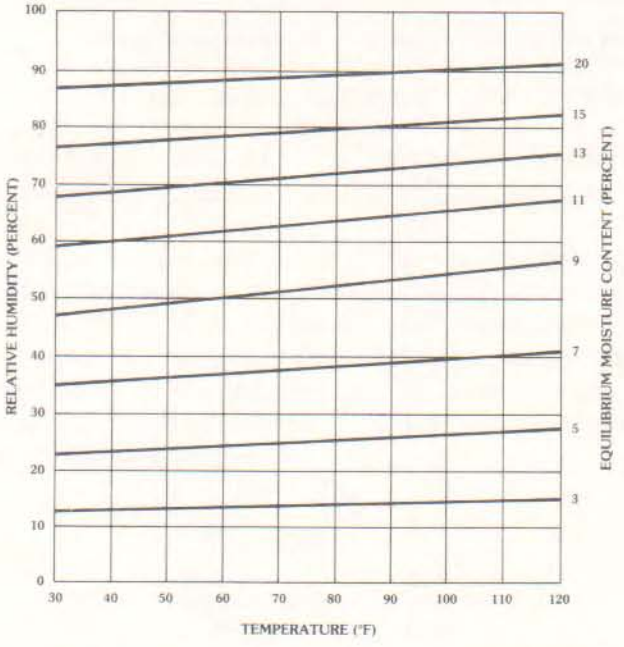


Figure 2. Equilibrium moisture content of wood as related to air temperature and relative humidity.

Under normal conditions, the EMC and thus the shrinking and swelling of wood varies between seasons of the year. Figure 2 shows that at a temperature of 70°F and a relative humidity of 30 percent, the resulting EMC of wood is about six percent. These conditions would be typical for a heated home without humidification during winter months in Indiana. During summer months, at 70°F the relative humidity would be closer to 70 percent and the resulting EMC would be slightly less than 13 percent. A change of seven percentage points in the EMC of wood will result in substantial dimensional change.

The EMC of wood and thus shrinking and swelling cannot be completely controlled under most situations. However, to prevent unnecessary problems with dimensional change, such as cracks developing in furniture or flooring, wood is dried to a moisture content which is an average EMC for the area in which it will be used. Table 3 shows these average moisture content values for different uses and locations in the United States.

How Wood Dries

Lumber dries because moisture in wood will move from zones of high concentrations to zones of low concentrations. Thus, wood will dry first on the surface. Moisture from inside the board then moves toward the surface and eventually evaporates.

During the drying process, several forces may be acting simultaneously to move water. These forces include:

1. Capillary action, which causes free water to flow, for the most part, through cell cavities and small openings in the cell wall (pits).

2. Differences in relative humidity in the wood which causes water vapor to move through various passageways by diffusion.

3. Differences in moisture content which move the bound water through the small passageways in the cell wall by diffusion.

When green wood starts to dry, evaporation of water from the surface sets up capillary forces which exert a pull on the free water in the zones of wood beneath the surface, resulting in a flow. This process is similar to the movement of water in a wick. Much of the free water in sapwood moves in this manner.

Movement of moisture by diffusion results from differences in the relative humidity and moisture content between the surface and the interior or between any two zones of the wood. Moisture in wood moves to the surface by simultaneous diffusion of vapor and bound water. In comparison with capillary movement, diffusion is a slow process.

Table 3. Recommended moisture content values for various wood items at time of installation.

	Moisture content for					
	Most areas of United States		Dry southwestern areas		Damp, warm coastal areas	
	Average	Individual pieces	Average	Individual pieces	Average	Individual pieces
	%	%	%	%	%	%
Interior:						
Woodwork, flooring, furniture, wood trim, laminated timbers, cold-press plywood	8	6-10	6	4-9	11	8-13
Exterior:						
Siding, wood trim, framing, sheathing, laminated timbers	12	9-14	9	7-12	12	9-14

The rate at which moisture moves through wood depends upon the permeability of the species being dried. Generally lighter woods will dry faster than heavy ones. Sapwood will dry faster than heartwood since its pits are "open," and it does not contain extractives or other obstructions as heartwood often does.

Moisture moves through wood in the longitudinal direction as well as laterally. Although diffusion is about 10 to 15 times faster longitudinally, drying in this direction (except for end checking and splitting) is not of practical importance except for short items. Because of rapid longitudinal diffusion, large stresses can develop at the ends of boards. These stresses can lead to end checking and deep splits on wide stock. End coatings are sometimes used to control longitudinal diffusion and thus reduce defects at the ends of the piece.

Since the surface or "shell" of a board dries first and begins to shrink, stress can build up. Stress can result in surface checking, and sometimes when it is severe, as in improper kiln drying or very rapid air-drying, stress can even cause collapse or checking in the interior of the board or "core."

As the shell of the board dries, it will begin to shrink, but the core will try to retain its original dimensions. Therefore, the shell of the board is stressed in tension, and surface checks will open up. These surface checks are common in oak as it begins to dry. Then, as the core eventually dries, it will shrink and relieve some of the tension in the shell, and the checks may close up. However, sometimes the shell of the board may become "set" and prevent the checks from closing completely. Or as the core begins to dry, it will be restrained by the shell, and internal checking will develop. Under proper conditions, most drying defects can be prevented. However, if drying becomes too rapid, serious damage to the wood can result.

Air-Drying Lumber

A great deal of the moisture in freshly cut hardwood lumber can be removed by air seasoning. Properly stacked lumber will dry to about 15 to 20 percent moisture content. The time it takes lumber to air-dry depends upon climatic conditions (temperature, relative humiditiy, and air movement or wind), wood species, lumber thickness, and piling method. Air seasoning times for green one-inch thick lumber for some common hardwood species are given in Table 4. The minimum times apply to lumber piled during good drying weather such as occurs in the spring and summer. Lumber piled late in the summer, or lumber that is piled during the fall or winter, will usually not reach a moisture content of 20 percent until the following spring. This accounts for the maximum periods given in the table.

The wood species also affects the drying rate. In general, the relatively lightweight species such as yellow poplar, silver maple, and basswood will air season at a faster rate than the relatively heavy woods such as oak, walnut, cherry, and beech. Oak is noted as a slow and difficult wood to dry, and some serious checking and splitting can even occur during air-drying.

Lumber cut two inches thick will require three to five times longer to air season than the times given in Table 4. Lumber cut thicker than two inches, particularly of the hard-to-dry woods such as oak, is even more difficult to air season and will require substantially longer time periods.

Table 4. Approximate time to air-dry green 1-inch lumber to 20 percent moisture content.

Species	Time (days)
Ash (White)	60–200
Basswood	40–150
Beech	70–200
Cherry	70–200
Cottonwood	50–150
Elm (American)	50–150
Hackberry	30–150
Hickory	60–200
Maple (Silver)	30–120
Maple (Sugar)	50–200
Oak (Red)	70–200
Oak (White)	80–250
Sweetgum	
Heartwood	70–300
Sapwood	60–200
Sycamore	30–150
Blackgum (Tupelo)	70–200
Walnut	70–200
Yellow-Poplar	40–150

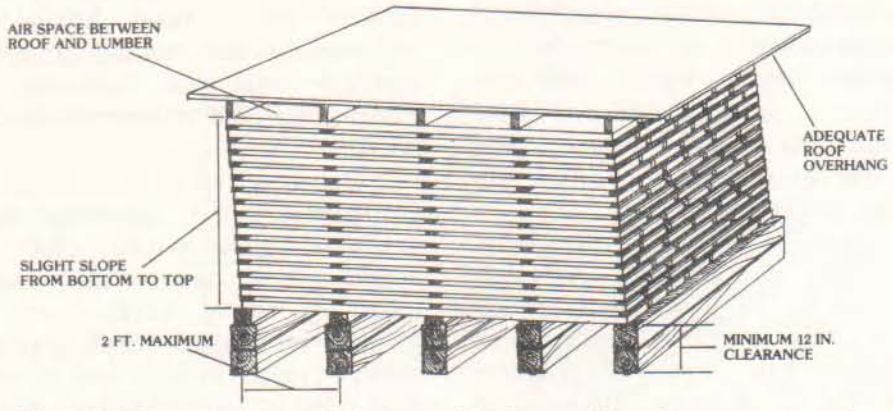


Figure 3. Diagram of essential features of lumber stacking for proper seasoning.

To air-dry lumber in a reasonable time period and to prevent excessive amounts of degrade, certain steps should be followed. Figure 3 illustrates the essential features of a well constructed lumber pile.

Start with a good foundation. In commercial situations, air-drying yards are often paved or at least built up with road rock and are graded so that all water will run off rapidly. Lumber foundations are sometimes made with concrete footings and iron- or pressure-treated crossbeams or stringers bolted directly to the concrete. The foundation should be constructed in such a way that air is allowed to circulate freely under the pile. Weeds, grass, and other vegetation must be eliminated around the pile. The foundations are sometimes sloped to allow rain water to run off the lumber pile.

The lumber pile should be oriented so that the prevailing winds will blow across the boards. Commercial lumber piles are often eight feet wide, but more rapid drying is likely with narrower piles. However, some care must be exercised when green lumber of the difficult-to-dry species is exposed to persistent hot, dry winds. In these cases, the lumber can suffer serious degrade unless the pile is protected

However, lumber can be dried without such elaborate foundations. Railroad crossties, heavy timbers, or cement blocks can be used as a foundation. Regardless of how the foundation is erected, it is important that it slopes from front to back about one inch for every foot of length to insure water run-off. The lowest point of the pile should be at least 12 inches above ground level. Make certain that the cross members are in perfect alignment since any low or high spot or a twist from opposite corners of the pile will result in lumber with about the same amount of warp. Cross members should be arranged so that one is present at the very front of the pile, at the very back of the pile, and at about two foot intervals in between. Wood strips called stickers are placed directly above each crossbeam to space the lumber. It may also be helpful to cover the soil beneath and around the lumber pile with black polyethylene to keep the moisture from moving from the soil to the wood and to keep weeds and grass down which could restrict natural air movement.

The quantity of lumber to be piled will likely affect the method used. Ideally, the lumber should be sorted for length and thickness. Lumber of the same length should be put in one pile. If this practice is not feasible, the lumber should be "box piled" (Figure 4). For each tier of lumber, the long boards should be placed on the edges of the pile. Shorter boards should be on the inside and should alternate being flush with the front and back of the pile. Loose ends should not be allowed to overhang without support. It is also easier to put the thick lumber on the bottom of the pile. This positioning prevents some handling of the heavy stock, and the weight from the top of the pile will restrain this material as it dries, preventing excessive warping. Furthermore, the thick stock will take longer to air season. If you plan to use certain boards first, these should be near the top of the pile for easy access.

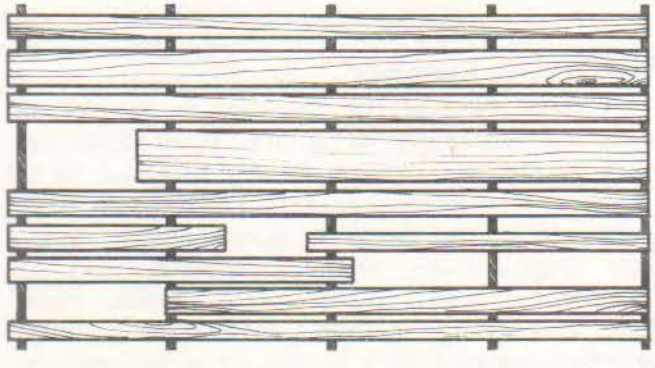


Figure 4. Plan view of a tier of boards, illustrating the system of alternating short lengths for box piling. Unsupported ends of boards placed on the inside will dry with less defect than if allowed to extend over the end of the pile.

Stickers are used to separate each tier of lumber so that the air can move between the boards. The stickers should be straight, of uniform thickness, free from bark, decay and stain, and thoroughly dry. Stickers are commonly 1-inch thick by 1-1/2 inches wide. The length of the stickers should be the width of the lumber pile. Thinner material can be used but it will likely result in slower drying. Building lathe doubled in thickness is sometimes appropriate if standard-size material is not available. Be certain that an adequate supply of stickers is available so that green lumber can be piled promptly.

The stickers must be placed directly over the foundaton crossbeams, with the ends in good vertical alignment, so that each vertical tier of sticker is supported by a crossbeam. Some short boards will be encountered. Do not allow these board ends to occur directly over each other in succeeding layers. Stickers can help bridge an occasional gap, but the pile will be weakened, and the boards will likely warp if too many gaps occur in one spot. Likewise, boards which overhang the end of the pile by more than a foot or two without support will warp severely during drying.

In sloped lumber piles, each course of boards should protrude slightly beyond the board ends in the previous layer so that the front of the pile is pitched slightly forward. To reduce severe end splits, it is helpful to place a sticker directly at the end of the board; even overlapping by about 1/4 to 1/2 inch is helpful. As the pile is built up, these stickers and boards are compressed, thus reducing end splits.

In properly piled lumber, the weight of the lumber helps prevent excessive warping in all but the top courses. Therefore, the low grade boards should be placed on top of the pile. Other weights such as concrete blocks will help restrain the top course of lumber.

The lumber pile should also be covered. In commercial operations, roofs are constructed of galvanized sheet metal or of lumber covered with roofing paper. Practically any device which sheds water can be used. The roof should extend two feet beyond the front and back of the pile. An air space of four to six inches should be left between the top of the pile and the bottom side of the roof.

End Coatings

Lumber dries several times faster from the ends of a board than from the surface or edges. As a result, wide boards often check severely. This checking can be reduced by end coating. Commercial end coatings are available, but it may be easier to use readily available materials when dealing with small quantities of lumber. Aluminum paint in a spar varnish base or asphalt roofing cement will work well. This end coating can be applied to the lumber or even to logs before they are cut.

Lumber Stain and Wood Borers

Both fungal type stain and wood borers can be a serious problem in green hardwood lumber and can be controlled by the use of chemicals. However, if your logs are sawed into lumber soon after the trees are felled and lumber is stacked to air-dry within a few days after being cut, few problems will be experienced. Also, substantially fewer problems are experienced from fungi (stain) and insects when logs and lumber are cut during cold weather rather than in the hot summer months. For additional information about stain and borers, consult the list of additional readings at the end of this publication.

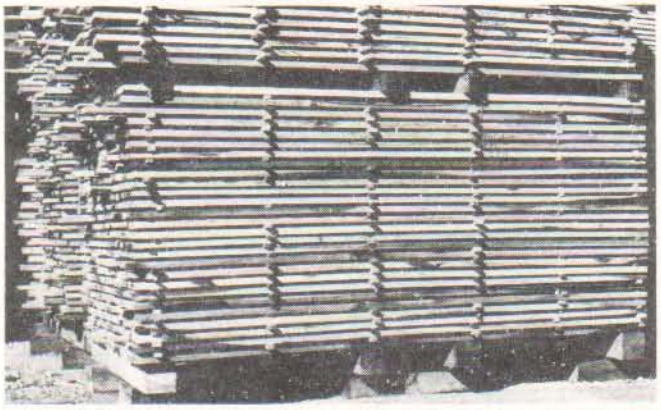
Additional Drying Procedures

Thoroughly air seasoned lumber is suitable for constructing unheated garages, barns, or other farm buildings. However, air-dried lumber *is not* suitable for indoor use. Well air seasoned lumber can dry to about 15 to 20 percent moisture content while lumber used inside should have a moisture content of only six to eight percent. Therefore, further drying is necessary.

Commercially, dry kilns are used to bring the moisture content of lumber down to the six to eight percent range. Unfortunately, most commercial kiln operations cannot economically handle and dry small quantities of lumber. However, if you should have access to a dry kiln, be certain that the kiln operator has set up a stress relief period at the end of the drying cycle. Failure to relieve stresses set in wood during kiln drying causes saw pinching and warping of boards when they are ripped.

If access to a dry kiln is not possible, some alternatives do exist. For example, small quantities of well air seasoned lumber can be further air-dried in areas subject to natural heating such as attics and the overhead space in garages during summer months. In houses without mechanical humidification, small pieces of well air-dried stock can usually be dried during the winter months in a few weeks to a suitable moisture content simply by bring them inside.

Limited experience with a small solar heated dryer in southern Wisconsin (43° North latitude) shows that solar heating can be used to dry



Well-constructed lumber pile under commercial conditions.

lumber suitable for high quality uses such as furniture. The dryer will reduce the moisture content of lumber to about eight percent. Additional information and construction plans are available by requesting Forest Products Utilization Technical Report No. 7, "Constructing and Operating a Small Solar-Heated Lumber Dryer" from the U.S. Forest Products Laboratory, Box 5130, Madison, Wisconsin 53705.

Regardless of what substitute method is used for kiln drying, extreme care must be exercised to see that the lumber finally reaches a moisture content of six to eight percent. Otherwise, shrinking, warping, and checking of the lumber after it is put into use is likely. One approximate method to determine if the wood is dry enough to use is to cut a section approximately one inch in length across the grain from each of several of the wider boards. To avoid the effects of earlier end drying, the section should be cut from the center portion of the boards and should be several inches from any knot or other defect. Measure the width of this board section to within 1/64 inch. Place the section near an operating radiator, hot air register, or stove for *at least* one day. If no checks appear on the ends and no measurable shrinkage in width occurs, the wood is uniformly dry to a moisture content of about six to eight percent.

Additional Readings

Air Drying of Lumber—A Guide to Industry Practices. 1971. Agr. Handbook No. 402, USDA Forest Service, 110 pp. (For sale by the Superintendent of Documents, Goverment Printing Office, Washington, D.C. 20402).

Storage of Lumber. 1978. Agr. Handbook No. 531, USDA Forest Service, 63 pp. (For sale by the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402).

Dry Kiln Operator's Manual. 1961. Agr. Handbook No. 188, USDA Forest Service, 197 pp. (For sale by the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402).

"Sap Stain in Hardwood Logs and Lumber," FNR 90, 6 pp. (Available from Agriculture Mailing Room, Agricultural Administration Building, Purdue University, West Lafayette, IN, 47907).*

"Powder Post Beetles," E-73, 2 pp. (Available from Agriculture Mailing Room, Agricultural Adminstration Building, Purdue University, West Lafayette, IN, 47907).*

Acknowledgement

Acknowledgement is given to the numerous technical wood drying publications of the U.S. Forest Products Laboratory, Forest Service, Madison, Wisconsin.

*Free of charge to Indiana residents. Out-of-state residents should request a price quotation from the Mailing Room.

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FNR-118

forestry & natural resources

WOODLAND MANAGEMENT

Growing Christmas Trees

by John R. Seifert
Department of Forestry and Natural Resources

This publication will acquaint the prospective grower with the basics of growing Christmas trees and help him avoid management errors that could cost years of lost profits or complete plantation failure.

It has been said over and over again, "There is no such thing as a free lunch." Truer words were never spoken when applied to Christmas tree production. Every year hundreds of optimists plant tree seedlings expecting to come back in seven to ten years and make a killing on the Christmas tree market.

Grim reality usually rears its ugly head early as weeds and rodents seem to flourish at the expense of newly planted seedlings. Shearing and insect problems seem endless.

Even after all the hard work, well-managed plantations may only yield 50 to 80 percent salable trees. The rest can be lost to mortality, poor quality, or some other malady. So before you purchase the new seedlings, consider all of the above. Are you really sure you want to commit a significant amount of time to manage a successful Christmas tree operation? Can you find temporary labor to complete the seasonal cultural operations? Can you market your trees to yield a satisfactory return on your investment? If the answers are yes, read on for a few suggestions to help you get off on the right foot.

Site Selection

"All Life is Rooted in the Soil." Before planting any crop, the soil and site characteristics must be examined. While the pines will grow on a variety of soil types, more careful site selection is needed for the spruces, firs, and Douglas-fir. Soils vary in their texture, depth to root restrictions, stoniness, fertility, and soil moisture-holding capacity. The slope steepness, slope direction (north facing, etc.), and vegetative cover also influence soil characteristics and, ultimately, the survival and growth rates you can expect from tree seedlings.

As a rule, trees grow best on north or east facing, level to moderately sloping, deep well-drained soils with adequate fertility. Unfortunately, weed competition on these sites is more severe. Growing spruces, firs, and Douglas-fir should be confined only to these better sites in Indiana.

While it is true that Scotch pine will grow well on steep, eroded, or infertile land, the increased rotation length, equipment, and maintenance costs make these sites less desirable. Therefore, the investment in intensive management required to produce high-quality trees is best spent on gently sloping, accessible sites that will produce a saleable 6-foot tree in six to eight years. Avoid poorly drained sites as growth rates and survival will be low, and equipment operation impossible.

Refer to FNR-36, *Planting Forest Trees and Shrubs in Indiana,* for a list of the site requirements for Christmas tree species. To determine the soil characteristics of your proposed plantation, obtain a copy of your county soil survey, available from the Soil Conservation Service.

Site Preparation

Control of competing vegetation prior to planting, called site preparation, is a critical first

step in plantation establishment. There are several methods that can be used: (1) bulldozer with root rake, (2) mowing, (3) herbicides, (4) plowing or disking, and (5) a combination of these methods.

Hard-to-kill perennial vines and hardwood sprouts should be controlled prior to planting. After planting, these weeds are difficult to control without damage to Christmas tree seedlings. Use of the proper herbicides as a site preparation treatment will prevent resprouting of weeds resulting in season-long weed control. In addition, removal of stumps and smoothing rough spots and ditches will make subsequent mowing and other equipment operation more efficient.

If weed competition is not expected to be severe, such as in eroded, old field sites, a banded application of a soil (pre-emergent) and foliage (post-emergent) active herbicide tank mix will give lasting control around the seedlings. Seedling survival and first year growth will increase, and subsequent mowing will be easier. The remaining strips of vegetation between rows will help prevent erosion. On non-erosive soils a broadcast application may be desirable.

Herbicides can be applied with a variety of hand or tractor drawn equipment. Small growers may find the backpack hand sprayer a useful tool for all pesticide application. Rope wicks, paint rollers, or other wiping devices may also be useful for some weed problems. For information on calibration of hand equipment and specific herbicide recommendations, see *Use of Herbicides for Establishing Woody Plants.*

Planting Stock

Scotch pine and eastern white pine are the most common Christmas tree species grown in Indiana. They are best adapted to the Indiana soils and climate. Spruces, firs, and Douglas-fir are also grown but require ideal soil conditions and a longer harvesting rotation.

Many genetic varieties of Scotch pine are available from local nurseries. It is difficult to prescribe to a grower which variety will perform best under his growing conditions, management practices, and in local markets. Each variety has its own unique growth rate, needle length, winter needle color, needle retention, butt diameter, stem straightness, branch angle, and overall form. Visit with experienced growers, nurserymen, or foresters to select a variety to match your soil and market condition. Initially, you should plant two or three varieties. Observe the characteristics of these varieties through a rotation to determine which performs better for you.

Eastern white pine is gaining popularity as a Christmas tree in Indiana. Rotation length and management practices are similar to Scotch pine, only white pine has a slightly higher market value. White pine grows well on most Indiana soils with the exception of dry, severely eroded and wet sites. If site quality is adequate, a small percentage of your first planting should be white pine.

Seedling Size

The planting stock size and vigor is critical to survival and establishment. Examine seedlings carefully upon shipment from the nursery. Roots should be moist and free of mold or fungus, and seedling foliage should have good color and not be dehydrated.

Plant the seedlings as soon as possible or store in a cooler at 34° to 38°F. Do not allow seedlings to freeze. If a cooler is not available, keep the seedlings in a shaded, cool place such as a basement. Seedlings held for more than five days without a cooler should be "heeled in." That is, spread the seedlings roots along shaded trench and cover with moist soil. Keep the soil moist until planting.

Most seedlings are grown from seed in nursery beds and are called bareroot seedlings. Some nurseries offer containerized seedlings that are greenhouse grown. These container-grown seedlings usually have a more fibrous root system but cost significantly more.

Bareroot seedlings may be grown for one to three years in a high-density seedbed. They are then sold or transplanted at lower densities for one to two more years. Seedlings are advertised and priced by age and species. The seedling age may be listed as 2-0. The first number indicates years in a high-density seedbed. The second number indicates years in a low-density transplant bed. If the second number is 0 (e.g., 2-0), the tree is a two-year-old seedling. If the second number is 1 (e.g., 2-1), the tree is a three-year-old transplant.

Two-year-old seedlings are usually 4 to 12 inches tall with a small stem diameter. Seedlings smaller than 8 to 12 inches are easily overgrown by weed competition and are an easy target for mice and other rodents. Order more seedlings than you need, then plant only the largest and healthiest. If severe weed competition or rodent

problems are anticipated order 2-1 transplants. The larger seedling will yield better survival and first-year growth, ultimately reducing rotation length. The cost of transplants will be higher but may be necessary for successful plantation establishment.

Planting Design

Spacing between trees and overall plantation design depends on terrain, species planted, and type of machinery used for maintenance. If you own mowing equipment select a between-row spacing at least 2 feet wider than the mower. This will facilitate mowing in later years since a 6-foot-tall tree with 67 percent taper will be 4 feet wide at the base. Rarely should spacing of trees be less than 5 feet. Tighter spacing increases competition among trees and causes difficulty in shearing, spraying, and other management practices (Table 1).

Planting seedlings on a grid pattern (e.g., 6 feet x 6 feet) facilitates mowing in both directions. This is highly desirable from the standpoint of weed control but may increase the planting costs. Straight rows are essential to prevent damage to seedlings during cultural operations. Rows should be laid out prior to planting, using permanent stakes or wire flags.

When planting several species, separate each species into a management unit (Figure 1).

Table 1. Number of Christmas trees per acre for different spacings.

Spacing (feet)	No.trees /acre	Spacing (feet)	No.trees /acre
5 x 5	1742	6 x 7	1037
5 x 6	1452	6 x 8	908
5 x 7	1245	7 x 7	889
5 x 8	1089	7 x 8	778
6 x 6	1210	7 x 8	681

This facilitates application of selective herbicides, spraying for specific insect or disease problems, and other cultural practices unique to that species. The rows of the management unit should be longer than wide to reduce equipment turnaround time. The type of spray equipment you plan to use may dictate the width of the management unit. The management units are separated by lanes large enough to be used in harvesting, spraying, and turning equipment around. The plantation should be accessible by an all-weather road since harvesting and other cultural operations occur year-round.

Planting

Spring planting is preferred in Indiana, eliminating the problem of frost heaving that is com-

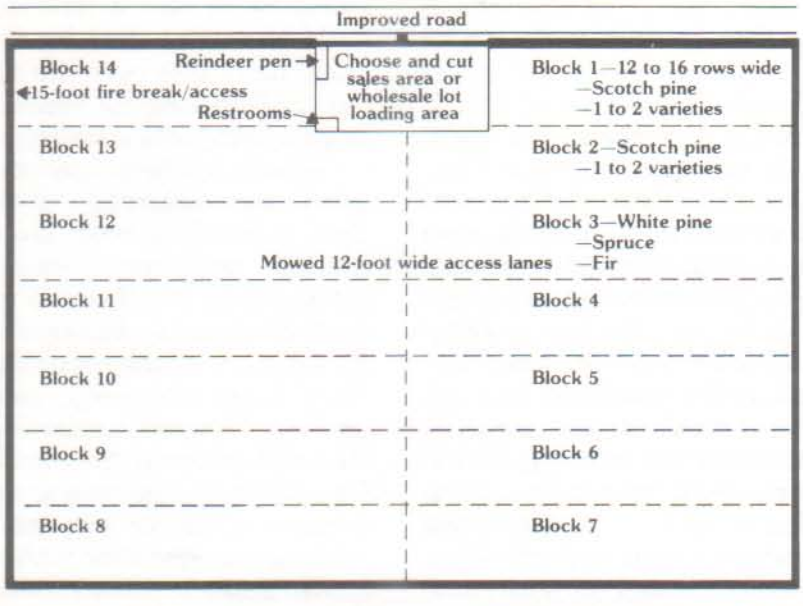

Figure 1. Sample layout of a 14-acre plantation. To maintain sustained production of trees, plant 2 or 3 blocks each year, depending on rotation length. Keep species separate because of different maintenance requirements and growth rates.

mon to fall-planted seedlings. Planting should begin as early as possible. However, do not plant in frozen soil or under saturated soil conditions.

Christmas trees may be planted using a variety of hand tools or a machine planter. New growers should start with a small number of trees (1,000 to 2,000) which can be easily planted by hand. Additional management units can be planted annually to produce a sustained yield of harvest size trees.

The most productive hand planting tools are planting bars, hoes, and shovels. Production with these tools will range from 300 to 800 trees per day depending on the skill of the planter, stock size, and site conditions. Round pointed shovels, spades, and mattocks can be used but production is slower.

Machine planting production may vary from 2,000 to 5,000 trees per day, depending on terrain, stock size, soil moisture, and rock content. A skilled machine planting crew can do a high-quality planting job within the limits of slope steepness, rockiness, and stock size.

Some mortality can be expected even with the best planting job. Survival of 90 to 95 percent is excellent. Always plan to replant first-year mortality and unhealthy seedlings to avoid underutilization of the planting site.

See FNR-36 *Planting Forest Trees and Shrubs in Indiana* for a description of hand planting techniques and other information on plantation establishment.

Weed Control

The best weed control technique for newly planted seedlings is preplant (at least two weeks) site preparation. If tillage, mulching, herbicides, or a combination of these methods was used, weeds will be controlled for at least one to three months. This is sufficient to bring the delicate new seedlings through the first growing season (Figure 2). A late-season mowing may be necessary to clean up the plantation.

If herbicides are not used for site preparation, subsequent cultivation or mowing will be necessary to prevent weeds from overtopping the trees. Cultivation should be shallow (less than 2 inches) to prevent tree root damage. Mulching gives excellent weed control and preserves soil moisture but may not be practical for large plantations. Mowing-only weed control does not remove the competing vegetation close to the seedling where weeds are most harmful. Repeated mowings (two to seven) may be necessary to keep weeds down.

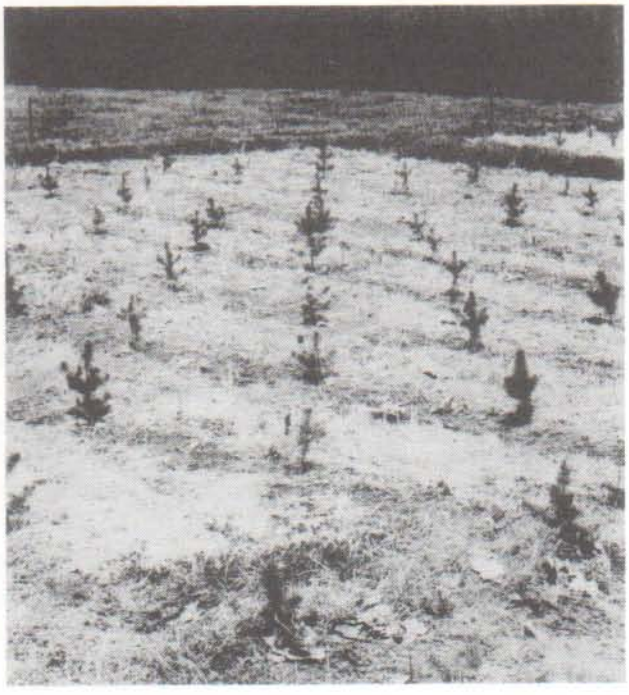

Figure 2. Good weed control is especially important in newly established plantations.

Foliage-active herbicides can be applied in spots around newly planted seedlings. Take care to shield the trees with a device such as stovepipe or use a directed spray to prevent herbicide from contacting the seedlings. Do not apply herbicides over the top of actively growing seedlings without carefully reading the label or consulting with a herbicide specialist.

Weed control in later years can be achieved using any combination of the above methods. Spot, banded, or broadcast applications of soil-active in combination with foliage-active herbicides can be made in the fall prior to the first frost or in spring before the weeds germinate. Spring applications should be completed before trees break dormancy, as evidenced by bud swelling. Directed sprays or sprayer shields can be used to keep the herbicide off the trees. Depending on the tree species, age, and product, trees may or may not be tolerant of an over-the-top application. Again, read the label. It will specify how the product can be applied to the trees without damage.

Many growers prefer the fall herbicide application. Adequate weed control can be obtained well into the next growing season. Spring prob-

lems of rainy weather, wind, saturated soil conditions, and planting conflicts are avoided.

The weed control technique you use depends on a lot of factors: specific weed problem, equipment and labor available, grower's philosophy on chemical use, site conditions, and more. Experiment with different techniques until you find the method you are most successful with.

Fertilization

Fertilization is not usually recommended for newly planted seedlings. However, applications to establish plantations on infertile sites may be beneficial. Fertilization must be combined with good weed control. Using slow-release fertilizers without applying a herbicide can stimulate severe weed problems. Removal of competing vegetation alone increases the availability of moisture and nutrients, essentially fertilizing the trees.

Scotch pine normally does not need fertilization; however, it may benefit from fertilizer application on very dry, infertile sites. The spruces, firs, and Douglas-fir may benefit from fertilization on marginal sites. If low fertility is a problem, fertilize with a balanced slow-release fertilizer such as 12-12-12. Apply in spots or bands along the rows of seedlings. As with herbicide application, calibrate your fertilizer equipment. Rates of 150 to 225 pounds per acre of actual nitrogen should be adequate.

Shearing

Shearing is the most important cultural activity involved in producing a high quality Christmas tree. Shearing probably gives the greatest dollar return for labor invested. Consult with experienced growers to develop your shearing expertise. Some pruning to remove double leaders, dying branches, or wild growth may be necessary in year two. Heavy shearing should not begin until year three or four and continues until harvest.

The practice of shearing Christmas trees is to control the height and width of the tree and to produce a conical shaped tree with uniform taper. Besides shaping, the shearing process stimulates more buds to form near the newly cut branch end. More branchlets are formed the next year, increasing tree density. Insect and disease damage can be removed at shearing time, and this is an important step in controlling infestations.

Taper of a Christmas tree is defined as the relationship of tree height to tree width at the base (Figure 3). The ideal taper for a Scotch pine Christmas tree is about two-thirds as wide as it is high, or 67 percent taper. A tree 6 feet tall and 4 feet wide at the base would have a 67 percent taper.

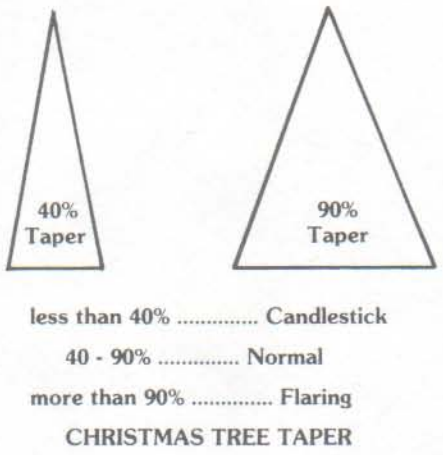

Figure 3. Diagram showing relative taper of Christmas trees.

The U.S. Department of Agriculture has developed the "United States Standards for Grades of Christmas Trees." The standards designate four quality classes of trees: (1) Premium, (2) Choice or No. 1, (3) Standard or No. 2, and (4) Cull. These categories are based on foliage characteristics, tree density, taper, and defect-free faces on the tree. New growers should review these standards before beginning to shear their trees.

The pines must be sheared immediately after height growth stops and buds are set. This generally occurs in early or mid-June. Shearing should be completed by early July, or budset may be reduced causing poor growth the following year.

Timing is not as critical with the spruces, firs, and Douglas-fir. They can be sheared anytime after height growth ceases and before budbreak in spring. Most growers shear these species after the pines or when other work slacks off.

Shearing tool selection depends on grower preference, tree species, and time constraints. Lightweight knives with 14- to 16-inch blades are preferred over hedge shears by many growers. Production rates are higher for knives, but special safety precautions must be

taken. Leg protection and a reinforced glove should be worn at all times. In addition, hand pruners are needed to remove double leaders and dead branches (Figure 4).

Figure 4. Removal of double leaders during shearing creates straight, single-stemmed trees.

Regardless of the tool used it is essential they be kept sharp and free of pitch buildup. Kerosene, fuel oil, or mineral spirits may be used to clean tools. Dull tools cause jagged or incomplete cuts on the tree and slow production. Some stripping of bark may also occur, reducing budset on that branch. Tree vigor may be reduced, predisposing it to insect or disease attack.

Growers must supervise the shearing operation very closely. New shearers should be trained slowly and carefully. Use them to clean trees or assist in tool maintenance until they are thoroughly familiar with the shearing operation.

Shearing is the most critical step in the Christmas tree operation after establishment. A poor shearing job may ruin the marketability of a good tree. New growers should visit experienced growers during shearing season or seek other assistance before beginning their first shearing operation.

Plantation Protection

A number of insects, animals, or other pests may attack your plantation. New growers must familiarize themselves with the life cycles of insects and diseases that affect Christmas trees and plan surveillance to detect signs of these pests. Insect feeding habits vary, requiring that you visit your plantation weekly during the spring and summer (Figure 5). Insect and disease problems must be detected early so that control measures can be taken. See E-32 *How to Combat Insect Pests of Pine Trees* for more information.

Good weed control practices will help protect new plantations from mice and rabbit damage. Removal of the tall vegetation eliminates cover and subjects the rodents to other preda-

Figure 5. Frequent visits are necessary to monitor insect, disease, and weed problems in the spring and summer.

tors. In plantations where mouse girdling becomes severe, use of rodenticides may be necessary.

A deer browse problem is more difficult to control. Locating plantations in remote areas may invite costly browse of small tree buds and debarking on larger trees. Deer repellents, physical barriers on trees (e.g., plastic netting), or fencing techniques may reduce the problem but are expensive.

Livestock are not compatible with Christmas tree production. They cause significant damage by feeding, trampling, or rubbing on the trees. The less obvious damage, soil compaction, is reason enough to keep livestock out of the plantation. Livestock hooves compact the soil in the upper 4 to 6 inches of the soil profile. This is the zone of maximum moisture and nutrient uptake and oxygen exchange by the tree roots. Compaction damages fine feeder roots in this zone, and reduces infiltration of rainfall, causing increased runoff and erosion. The result is reduced vigor of the trees, making them more susceptible to insect and disease problems.

Fire is devastating in a Christmas tree plantation. The planting design should allow for a buffer strip around the plantation to serve as a firebreak. As pine trees near harvest age, a heavy build-up of dead needles beneath and spread throughout the tree make Christmas trees highly flammable. Close mowing or plowing a 10-foot strip usually provides a sufficient firebreak.

Harvesting and Marketing

The method of marketing your Christmas trees depends on the proximity of your plantation to population centers, accessibility of the plantation, and the effort you want to devote to selling.

A wholesale operation requires a large input of labor just prior to the Christmas season to cut, clean, and bale trees for shipment. Reputable buyers must be located well in advance (the previous year is best) to assure a market for all financially mature trees. Holding trees beyond the optimum market size (5½ to 7 feet) may reduce the rate of return. A specialty market for large trees would be an exception.

Normally, growers try to harvest all trees in a management unit within a three-year period. Ideally harvested units should lie fallow for one year to help check insect and disease problems such as pine root collar weevil and Lophodermium needle cast. Weed and brush problems may be easily controlled during the fallow period, using the proper herbicides. If you do not let a management unit lie fallow, treat all stumps with an insecticide to prevent reinfestation of the newly planted trees by insects.

Selling trees retail is another outlet. Using this method, you must bear the cost of transportation and lot rental. Others prefer the choose and cut method of sales. Families can select and perhaps cut their own tree from the plantation. A family tradition of coming to the same farm every year is often developed.

Choose and cut growers often diversify their sales by offering an assortment of other Christmas products at the plantation. Music, hot apple cider, and reindeer all add to the customer's experience and keep families coming back year after year. Use your imagination to make your operation a unique and successful business. Sell Christmas, not just a tree!

Summary

Growing Christmas trees can be a profitable and satisfying business. However, it requires significant inputs of seasonal labor and expertise in diagnosing insect, disease, and other problems. Consult experienced growers for help in avoiding early problems. Other sources of assistance are the Indiana Christmas Tree Growers' Association, consulting foresters, Indiana Division of Forestry, Purdue Department of Forestry and Natural Resources, the Cooperative Extension Service, or Soil Conservation Service.

Helpful Publications

Ohio Christmas Tree Producers Manual. Bulletin 670. Cooperative Extension Service, 2120 Fyfe Road, Ohio State University, Columbus, Ohio 43210. Price: $3.75.

Christmas Trees—A Management Guide. EC-76-1741. Dept. of Ag. Communications, University of Nebraska, Lincoln, Nebraska 68583. Price: $1.25.

Use of Herbicides in Establishing Woody Plants. Dept. of Natural Resources, Division of Fish and Wildlife, 607 State Office Building, Indianapolis, Indiana 46204.

U.S. Standards for Grades of Christmas Trees. 1989. U.S. Dept. of Agriculture, Agricultural Marketing Service, Washington, D.C. 20402.

Christmas Tree Pest Manual. Stock #001-001-00641-6. Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price: $14.00.

Also available from Publications Mailing Room, 301 South Second Street, Lafayette, IN 47905-1092:

FNR-36 Planting Forest Trees and Shrubs in Indiana

E-41 Recommendations for Managing Insects on Shade Trees and Shrubs $3.00

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