Agroforestry is an integrated approach of using the interactive benefits from combining trees and shrubs with crops and/or livestock. It combines agricultural and forestry technologies to create more diverse, productive, profitable, healthy and sustainable land-use systems.

**Definitions**

“Agroforestry is a collective name for land use systems and practices in which woody perennials are deliberately integrated with crops and/or animals on the same land management unit. The integration can be either in a spatial mixture or in a temporal sequence. There are normally both ecological and economic interactions between woody and non-woody components in agroforestry” World Agroforestry Centre (ICRAF) 1993

In agroforestry systems, trees or shrubs are intentionally used within agricultural systems, or non-timber forest resources are cultured in forest settings. Knowledge, careful selection of species and good management of trees and crops are needed to optimize the production and positive effects within the system and to minimize negative competitive effects.

In some areas, a narrow definition of agroforestry might be defined as simply: Trees on farms. Hence, agroforestry, farm forestry and family forestry can be broadly understood as the commitment of farmers, alone or in partnerships, towards the establishment and management of forests on their land. Where many landholders are involved the result is a diversity of activity that reflects the diversity of aspirations and interests within the community.

**Impacts**

Agroforestry systems can be advantageous over conventional agricultural and forest production methods through increased productivity, economic benefits, social outcomes and the ecological goods and services provided.

Biodiversity in agroforestry systems is typically higher than in conventional agricultural systems. Agroforestry incorporates at least several plant species into a given land area and creates a more complex habitat that can support a wider variety of birds, insects, and other animals. Agroforestry also has the potential to help reduce climate change since trees take up and store carbon at a faster rate than crop plants.

**Alley cropping**

Alley cropping, sometimes referred to as ‘sun systems’ is a form of Intercropping, and can be applied by farmers as a strategy to combat soil erosion, to increase the diversity of farmland, as a means for crop diversification and to derive other integrated benefits. In this practice, crops are planted in strips in the alleys formed between rows of trees and/or shrubs. The potential benefits of this design include the provision of shade in hot, dry environments (reducing water loss from evaporation), retention of soil moisture, increase in the structural diversity of the site and wildlife habitat. The woody perennials in these systems can produce fruit, fuelwood, fodder, or trimmings to be made into mulch.

**Forest Farming**

Forest farming, also known as ‘shade systems’ is the sustainable, integrated cultivation of both timber and non-timber forest products in a forest setting. Forest farming is separate and distinct from the opportunistic exploitation/wild harvest of non-timber forest products. Successful forest farming operations produce: Mushrooms, maple and birch syrup, native plants used for landscaping and floral greenery (e. g. Salal, sword fern, bear grass, cedar boughs and others), medicinal and pharmaceutical products (e. g. Ginseng, goldenseal, cascara or yew bark), wild berries and fruit.

**Silvopasture**

Silvopastures combine livestock grazing on forage crops or pastures within actively managed tree or shrub crops. Cattle, sheep and goats are the most common livestock incorporated into silvopasture systems and they may be deployed entirely within a private farm/woodlot silvopasture or through collaborative arrangements between forest licensees and livestock producers on public lands (e. g. In British Columbia, sheep grazing is used as a vegetation management tool in young forest plantations).

**Riparian Buffers and Integrated Riparian Management**

Riparian buffers are managed forest and shrubs belts in areas bordering lakes, streams, rivers, and wetlands. Integrated riparian management systems are used to enhance and protect aquatic and riparian resources as well as generating income from timber and non-timber forest products. Similar to shelter and timberbelts, integrated riparian management systems can employ a wide variety of tree and shrub species, with specific plantings tailored to suit the specific growing conditions and production opportunities.

**Other Uses**

Agroforestry practices may also be employed to realize a number of other associated Environmental Services, including:

* Carbon sequestration
* Odour, dust, and noise reduction
* Waste water or manure management (e. g. Utilizing urban waste water on intensive, short rotation forests for wood fibre production)
* Green space and visual aesthetics.

Enhancement or maintenance of wildlife habitat.

Forestry is the art and science of managing forests, tree plantations, and related natural resources. Silviculture, a related science, involves the growing and tending of trees and forests. Modern forestry generally concerns itself with: Assisting forests to provide timber as raw material for wood products; wildlife habitat; natural water quality management; recreation; landscape and community protection; employment; aesthetically appealing landscapes; biodiversity management; watershed management; erosion control; and a ‘sink’ for atmospheric carbon dioxide. A practitioner of forestry is known as a forester. Note that the word “forestry” can also refer to a forest itself.

Forest ecosystems have come to be seen as one of the most important components of the biosphere, and forestry has emerged as a vital field of science, applied art, and technology.

## Manual tree planting is a common forestry technique

Replanting native eucalyptus where willows once grew. On the banks of Tambo River, Australia. Foresters may be employed by the Forestry Commission (in Britain) industry, government agencies, conservation groups, local authorities, urban parks boards, citizens'associations, or private landowners. Industrial foresters are predominantly involved in planning the forest regeneration process that starts with careful harvesting. Other foresters have specific jobs which include a broad array of responsibilities. For example, urban foresters work within town and city environments to manage the trees in urban green space. Some foresters work in tree nurseries growing seedlings for woodland creation or regeneration projects. Others are involved with tree genetics or developing new building systems as forest engineers. The profession has expanded to include a wide diversity of jobs, typically requiring an honors degree or college bachelor's degree up to the PhD level for highly specialized areas of work.

Traditionally, professional foresters develop and implement “forest management plans” These plans rely on tree inventories showing an area's topographical features as well as its distribution of trees (by species) and other plant cover. They also include roads, culverts, proximity to human habitation, hydrological conditions, and soil reports ecological sensitive areas. Finally, forest management plans include the projected use of the land and a timetable for that use.

In Britain, the Public Forest Estate cared for by the Forestry Commission, is also managed for social objectives, including public access and recreation (including the very popular forest concert venues), habitat conservation, biodiversity.

Plans for harvest and subsequent site treatment are influenced by the objectives of the land's owner or leaseholder (for instance, a timber company that holds cutting rights to a given tract of land, or the government in the case of state-owned forests). It is a feature of “good forestry practice” in Britain that plans must always consider the needs of other stakeholders (e. g. nearby communities or neighborhoods, or rural residents living within or adjacent to the woodland area). Plans are developed with the tree felling and environmental legislation in mind. They ultimately result in a prescription for the sustainable harvesting and replacement of trees, and will indicate whether road building or other forest engineering operations are required.

Traditional forest management plans are chiefly aimed at providing logs as raw material for timber, veneer, plywood, paper, wood fuel or other industries. Hence, considerations of product quality and quantity, employment, and profit have been of central, though not always exclusive, importance.

Foresters also frequently develop post-harvest site plans. These may call for reforestation (tree planting by species), weed control, fertilization, or the spacing of young trees (thinning of trees that are crowding one another).

While other duties of foresters may include preventing and combating insect infestation, disease, forest and grassland fires, there is an increasing movement towards allowing these natural aspects of forest ecosystems to run their course, where possible, usually excepting epidemics or risk of life or property. Foresters are specialists in measuring and modeling the growth of forests (forest mensuration). Increasingly, foresters may be involved in wildlife conservation planning and watershed protection.

## History

The use and management of forest resources has a long history in China, dating from the Han Dynasty and taking place under the landowning gentry. It was also later written of by the Ming Dynasty Chinese scholar Xu Guangqi (1562 − 1633). In the Western world, formal forestry practices developed during the Middle Ages, when land was largely under the control of kings and barons. Control of the land included hunting rights, and though peasants in many places were permitted to gather firewood and building timber and to graze animals, hunting rights were retained by the members of the nobility. Systematic management of forests for a sustainable yield of timber is said to have begun in the 16th century in both the German states and Japan. Typically, a forest was divided into specific sections and mapped; the harvest of timber was planned with an eye to regeneration.

Timber harvest is a common component of forestryThe practice of establishing tree plantations was promoted by John Evelyn; it had already acquired some popularity in the British Isles. Schools of forestry were established after 1825; most of these schools were in Germany and France. During the nineteenth and early twentieth centuries, forest preservation programs were established in the United States, Europe, and British India. Many foresters were either from continental Europe (like Sir Dietrich Brandis), or educated there (like Gifford Pinchot).

The enactment and evolution of forestry laws and binding regulations occurred in most Western nations in the 20th century in response to growing conservation concerns and the increasing technological capacity of logging companies.

Tropical forestry is a separate branch of forestry which deals mainly with equatorial forests that yield woods such as teak and mahogany. Sir Dietrich Brandis is considered the father of tropical forestry.

## Today

A modern sawmillToday a strong body of research exists regarding the management of forest ecosystems and genetic improvement of tree species and varieties. Forestry also includes the development of better methods for the planting, protecting, thinning, controlled burning, felling, extracting, and processing of timber. One of the applications of modern forestry is reforestation, in which trees are planted and tended in a given area.

In many regions the forest industry is of major ecological, economic, and social importance. Third-party certification systems that provide independent verification of sound forest stewardship and sustainable forestry have become commonplace in many areas since the 1990S. These certification systems were developed as a response to criticism of some forestry practices, particularly deforestation in less developed regions along with concerns over resource management in the developed world. Some certification systems are criticised for primarily acting as marketing tools and lacking in their claimed independence.

In topographically severe forested terrain, proper forestry is important for the prevention or minimization of serious soil erosion or even landslides. In areas with a high potential for landslides, forests can stabilize soils and prevent property damage or loss, human injury, or loss of life.

Public perception of forest management has become controversial, with growing public concern over perceived mismanagement of the forest and increasing demands that forest land be managed for uses other than pure timber production, for example, indigenous rights, recreation, watershed management, and preservation of wilderness and wildlife habitat. Sharp disagreements over the role of forest fires, logging, motorized recreation and others drives debate while the public demand for wood products continues to increase.

## Education

Prescribed burning is used by foresters to reduce fuel loadsThe first dedicated forestry school was established by Georg Hartig at Dillenburg in Germany in 1787, though forestry had been taught much earlier in central Europe. The first in North America, the Biltmore Forest School was established near Asheville, North Carolina, by Carl A. Schenck in 1898 on the grounds of George W. Vanderbilt's Biltmore Estate. Another early school was the New York State College of Forestry at Cornell also established in 1898. Early North American foresters went to Germany from the nineteenth century to study forestry. Some early German foresters also emigrated to North America.

In South America the first two forestry schools were established in Brazil, specifically in Vicosa, Minas Gerais, and in Curitiba, Parana.

Today, an acceptably trained forester must be educated in general biology, botany, genetics, soil science, climatology, hydrology, economics and forest management. Education in the basics of sociology and political science is often considered an advantage.

An interesting scope of work opens up for foresters interested in international politics. Organizations such as the Forest Policy Education Network (FPEN) are dedicated to facilitate the way into forest politics and to exchange information on the subject.

In India, forestry education is imparted in the agricultural universities and in Forest Research Institutes (deemed universities). Four year degree programmes are conducted in these universities at the undergraduate level. Masters and Doctorate degrees are also available in these universities

Tropic Ventures Rainforest Enrichment and Sustainable Forestry Project is registered under the Auxiliary Forest Program of Puerto Rico, and is a demonstration project for students and foresters interested in the sustainable management and preservation of tropical rainforest land.

In the United States of America, postsecondary forestry education leading to a Bachelor's degree or Master's degree is accredited by the Society of American Foresters.

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**Forest Conservation**  
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The conservation movement also known as nature conservation is a political, social and, to some extent, scientific movement that seeks to protect natural resources including plant and animal species as well as their habitat for the future. The early conservation movement included fisheries and wildlife management, water, soil conservation and sustainable forestry. The contemporary conservation movement has broadened from the early movement's emphasis on use of sustainable yield of natural resources and preservation of wilderness areas to include preservation of biodiversity. Some say the conservation movement is part of the broader and more far-reaching environmental movement, while others argue that they differ both in ideology and practice. Chiefly in the United States, conservation is seen as differing from environmentalism in that it aims to preserve natural resources expressly for their continued sustainable use by humans. In other parts of the world conservation is used more broadly to include the setting aside of natural areas and the active protection of wildlife for their inherent value, as much as for any value they may have for humans. Early worldwide conservation movement The nascent conservation movement slowly developed in the 19th century, starting first in the scientific forestry methods pioneered by the Germans and the French in the 17th and 18th centuries. While continental Europe created the scientific methods later used in conservationist efforts, British India and the United States are credited with starting the conservation movement. Foresters in India, often German, managed forests using early climate change theories (in America, see also, George Perkins Marsh) that Alexander von Humboldt developed in the mid 19th century, applied fire protection, and tried to keep the “house-hold” of nature. This was an early ecological idea, in order to preserve the growth of delicate teak trees. The same German foresters who headed the Forest Service of India, such as Dietrich Brandis and Berthold Ribbentrop, traveled back to Europe and taught at forestry schools in England (Cooper's Hill, later moved to Oxford). These men brought with them the legislative and scientific knowledge of conservationism in British India back to Europe, where they distributed it to men such as Gifford Pinchot, which in turn helped bring European and British Indian methods to the United States. Philosophy of early American conservation movement During the nineteenth century, Americans developed a deep and abiding passion for nature. The early evolution of the conservation movement began through both public and private recognition of the relationship between man and nature often reflected in the great literary and artistic works of the nineteenth century. Artists, such as Albert Beirstadt, painted powerful landscapes of the American West during the mid nineteenth century, which were incredibly popular images representative of the unique natural wonders of the American frontier. Likewise, in 1860, Frederic Edwin Church painted “Twilight in the Wilderness” which was an artistic masterpiece of the era that explored the growing importance of the American wilderness. Many American writers also romanticized and focused upon nature as a subject matter. However, the most notable literary figure upon the early conservation movement proved to be Henry David Thoreau. Throughout his work, Walden, Thoreau detailed his experiences at the natural setting of Walden Pond and his deep appreciation for nature. In one instance, he described a deep grief for a tree that was cut down. Thoreau went on to bemoan the lack of reverence for the natural world: “I would that our farmers when they cut down a forest felt some of that awe which the old Romans did when they came to thin, or let in the light to, a consecrated grove” As he states in Walden, Thoreau “was interested in the preservation” of nature. In 1860, Henry David Thoreau delivered a speech to the Middlesex Agricultural Society in Massachusetts; the speech, entitled “The Succession of Forest Trees” explored forest ecology and encouraged the agricultural community to plant trees. This speech became one of Thoreau's “most influential ecological contributions to conservationist thought” The early conservation movement in the United States was also successful due to the hard work of John Muir. Muir was a former carriage worker who was nearly blinded by an accident at work. After almost losing his sight, Muir decided to see “America's natural wonders” Based upon his travels throughout Yosemite and the Sierra Nevada Mountains, Muir wrote a collection of articles for Century magazine, entitled “Studies in the Sierra” In 1892, John Muir joined forces with the editor of “Century” Magazine, Robert Underwood Johnson, to establish the Sierra Club, an organization designed to protect America's natural resources and public parks. Early Americans recognized the importance of natural resources and the necessity of wilderness preservation for sustained yield harvesting of natural resources. In essence, the preservation of wilderness and landscapes were recognized as critical for future generations and their continued subsistence in a healthy environment. The foundation of the conservation movement is grounded during this period between 1850 and 1920. Ultimately, historical trends and cultural mind-sets were united, which influenced ideas and policy towards the early history of the conservation movement in the United States. Early American conservation movement America had its own conservation movement in the 19th century, most often characterized by George Perkins Marsh, author of Man and Nature. The expedition into northwest Wyoming in 1871 led by F. V. Hayden and accompanied by photographer William Henry Jackson provided the imagery needed to substantiate rumors about the grandeur of the Yellowstone region, and resulted in the creation of Yellowstone National Park, the world's first, in 1872. Travels by later US President Theodore Roosevelt through the region around Yellowstone provided the impetus for the creation of the Yellowstone Timberland Reserve in 1891. The largest section of the reserve was later renamed Shoshone National Forest, and it is the oldest National Forest in the US But it was not until 1898 when German forester Dr. Carl A. Schenck, on the Biltmore Estate, and Cornell University founded the first two forestry schools, both run by Germans. Bernard Fernow, founder of the forestry schools at Cornell and the University of Toronto, was originally from Prussia (Germany), and he honed his knowledge from Germans who pioneered forestry in India. He introduced Gifford Pinchot, the “father of American forestry” to Brandis and Ribbentrop in Europe. From these men, Pinchot learned the skills and legislative patterns he would later apply to America. Pinchot, in his memoir history Breaking New Ground, credited Brandis especially with helping to form America's conservation laws. “Conservation means the greatest good to the greatest number for the longest time. Pinchot” Pinchot wrote that the principles of conservation were: Development: “The use of the natural resources now existing on this continent for the benefit of the people who live here now. There may be just as much waste in neglecting the development and use of certain natural resources as there is in their destruction. The development of our natural resources and the fullest use of them for the present generation is the first duty of this generation.” Conservation: “The prevention of waste in all other directions is a simple matter of good business. The first duty of the human race is to control the earth it lives upon.” Protection of the public interests: “The natural resources must be developed and preserved for the benefit of the many, and not merely for the profit of a few.” History In 1891, Congress passed the Forest Reserve Act, which allowed the President of the United States to set aside forest lands on public domain. A decade after the Forest Reserve Act, presidents Harrison, Cleveland, and McKinley had transferred approximately 50, 000, 000 acres (200, 000 km2) into the forest reserve system. However, President Theodore Roosevelt is credited with the institutionalization of the conservation movement in the United States. For President Roosevelt, the conservation movement was not about the preservation of nature simply for nature itself. After his experiences traveling as an enthusiastic, zealous hunter, Roosevelt became convinced of “the need for measures to protect the game species from further destruction and eventual extinction” President Roosevelt recognized the necessity of carefully managing America's natural resources. According to Roosevelt, “We are prone to speak of the resources of this country as inexhaustible; this is not so” Nonetheless, Roosevelt believed that conservation of America's natural resources was for the successful management and continued sustain yield harvesting of these resources in the future for the benefit and enjoyment of the American people. Roosevelt took several major steps to further his conservation goals. In 1902, Roosevelt signed the National Reclamation Act, which allowed for the management and settlement of a large tract of barren land. Then, in 1905, President Roosevelt helped to create the United States Forest Service and then appointed respected forester, Gifford Pinchot, as the first head of the agency. [5] By the end of his presidency, Theodore Roosevelt, in partnership with Gifford Pinchot, had successfully increased the number of national parks as well as added area to existing forest reserves. Despite these advancements, the American conservation movement did have difficulties. In the early 1900S the conservation movement in America was split into two main groups: Conservationists, like Pinchot and Roosevelt, who were utilitarian foresters and natural rights advocates who wanted to protect forests “for the greater good for the greatest length” and preservationists, such as John Muir, the founder of the Sierra Club. Important differences separated conservationists like Roosevelt and Pinchot from preservationists like Muir. As a preservationist, Muir envisioned the maintenance of pristine natural environments where any development was banned. [5] Whereas conservationists wanted regulated use of forest lands for both public activities and commercial endeavors, preservationists wanted forest to be preserved for natural beauty, scientific study and recreation. The differences continue to the modern era, with sustainable harvest and multiple-use the major focus of the US Forest Service and recreation emphasized by the National Park Service. Legislation lobbied by hunters Hunters have worked closely with local and federal governments to enact legislation to protect wildlife habitats. The following examples represent hunter-advocated legislation enacted to generate funds for preserving and establishing habitats (Hunters Rule). The Ontario Federation of Anglers and Hunters successfully lobbied to prevent cuts in funding for the Community Fisheries and Wildlife Involvement Program by 50%. Pittman-Robertson Wildlife Restoration Act of 1937 In 1937, hunters successfully lobbied Congress to pass the Pittman-Robertson Wildlife Restoration Act, which placed an 11% tax on all hunting equipment. This self-imposed tax now generates over $700 million each year and is used exclusively to establish, restore and protect wildlife habitats. It is named for Nevada Senator Key Pittman and Virginia Congressman Absalom Willis Robertson. Federal Duck Stamp Program On March 16, 1934 President Roosevelt signed the Migratory Bird Hunting Stamp Act, which requires an annual stamp purchase by all hunters over the age of sixteen. The stamps are created on behalf of the program by the US Postal Service and depict wildlife artwork chosen through an annual contest. They play an important role in habitat conservation because 98% of all funds generated by their sale go directly toward the purchase or lease of wetland habitat for protection in the National Wildlife Refuge System. In addition to waterfowl, it is estimated that one third of the nation's endangered species seek food and shelter in areas protected using Duck Stamp funds. Since 1934, the sale of Federal Duck Stamps has generated $670m and helped to purchase or lease 5.2 million acres (21, 000 km2) of habitat. The stamps serve as a license to hunt migratory birds, an entrance pass for all National Wildlife Refuge areas and are also considered collectors items often purchased for aesthetic reasons outside of the hunting and birding communities. Although non-hunters buy a significant number of Duck Stamps, 87% of their sales are contributed to hunters. Distribution of funds is managed by The Migratory Bird Conservation Commission (MBCC). Conservation organizations founded by hunters There are a number of organizations founded by hunters and by those interested in preserving wildlife populations and habitats. One of the oldest and most well-known organizations is Ducks Unlimited. Another internationally recognized hunters'conservation organization is Safari Club International. Modern American conservation movement Ultimately, the modern conservation movement in the United States continues to strive for the delicate balance between the successful management of society's industrial progress while still preserving the integrity of the natural environment that sustains humanity. In a large part, today's conservation movement in the United States is a joint effort of individuals, grassroots organizations, nongovernmental organizations, learning institutions, and various government agencies, such as the United States Forest Service. For the modern era, the US Forest Service has noted three important aspects of the conservation movement: The climate change, water issues, and the education of the public on conservation of the natural environment, especially among children. In regards to climate change, the US Forest Service has undertaken a twenty year research project to develop ways to counteract issues surrounding climate change. However, some small steps have been taken regarding climate change. As rising greenhouse gases contribute to global warming, reforestation projects are seeking to counteract rising carbon emissions. In Oregon, the Department of Forestry has developed such a small reforestation program in which landowners can lease their land for one hundred years to grow trees. In turn, these trees offset carbon emissions from power companies. Moreover, reforestation projects have other benefits: Reforested areas serve as a natural filter of agricultural fertilizers even as new wildlife habitats are created. Reforested land can also contribute to the local economy as rural landowners also distribute hunting leases during the years between harvests. In essence, projects, such as reforestation, create a viable market of eco-friendly services mutually beneficial to landowners, businesses and society, and most importantly, the environment. Nonetheless, such creative plans will be necessary in the near future as the United States struggles to maintain a positive balance between society and the finite natural resources of the nation. Ultimately, through dedicated research, eco-friendly practices of land management, and efforts to educate the public regarding the necessity of conservation, those individuals dedicated to American conservation seek to preserve the nation's natural resources. Problem areas Deforestation and overpopulation are issues affecting all regions of the world. The consequent destruction of wildlife habitat has prompted the creation of conservation groups in other countries, some founded by local hunters who have witnessed declining wildlife populations first hand. Also, it was highly important for the conservation movement to solve problems of living conditions in the cities and the overpopulation of such places. Boreal forest and arctic The idea of incentive conservation is a modern one but its practice has clearly defended some of the sub Arctic wildernesses and the wildlife in those regions for thousands of years, especially by indigenous peoples such as the Evenk, Yakut, Sami, Inuit and Cree. The fur trade and hunting by these peoples have preserved these regions for thousands of years. Ironically, the pressure now upon them comes from non-renewable resources such as oil, sometimes to make synthetic clothing which is advocated as a humane substitute for fur (See Raccoon Dog for case study of the conservation of an animal through fur trade.). Similarly, in the case of the beaver, hunting and fur trade were thought to bring about the animal's demise, when in fact they were an integral part of its conservation. For many years children's books stated and still do, that the decline in the beaver population was due to the fur trade. In reality however, the decline in beaver numbers was because of habitat destruction and deforestation, as well as its continued persecution as a pest (it causes flooding). In Cree lands however, where the population valued the animal for meat and fur, it continued to thrive. The Inuit defend their relationship with the seal in response to outside critics. In other regions of the Arctic, the Sami in Scandinavia, Russia and the Evenk in Siberia, indigenous peoples and their traditional hunting and fur trade are making a clear stand against the more “modern” resource exploitation. [citation needed]. In Canada the Boreal Forest Conservation Framework is a multi-stakeholder initiative, which includes the Aboriginal peoples in the Canadian north. Eighty percent of the worlds furs are produced in these regions either through farming by groups such as SAGA or 22% by indigenous peoples. Fur and hunting it appears, as indeed Greenpeace are finding out in the Sami forests, is an economic barrier to development, deforestation etc. The WWF has established areas of traditional hunting and animal use in Siberia and these sable reserves are clearly based on the principles of “incentive conservation” Latin America (Bolivia) The Izoceno-Guarani of Santa Cruz, Bolivia is a tribe of hunters who were influential in establishing the Capitania del Alto y Bajo Isoso (CABI). CABI promotes economic growth and survival of the Izoceno people while discouraging the rapid destruction of habitat within Bolivia's Gran Chaco. They are responsible for the creation of the 34, 000 square kilometre Kaa-Iya del Gran Chaco National Park and Integrated Management Area (KINP). The KINP protects the most biodiverse portion of the Gran Chaco, an ecoregion shared with Argentina, Paraguay and Brazil. In 1996, the Wildlife Conservation Society joined forces with CABI to institute wildlife and hunting monitoring programs in 23 Izoceno communities. The partnership combines traditional beliefs and local knowledge with the political and administrative tools needed to effectively manage habitats. The programs rely solely on voluntary participation by local hunters who perform self-monitoring techniques and keep records of their hunts. The information obtained by the hunters participating in the program has provided CABI with important data required to make educated decisions about the use of the land. Hunters have been willing participants in this program because of pride in their traditional activities, encouragement by their communities and expectations of benefits to the area. Because of their spiritual beliefs, many hunters indigenous to this area used conservative approaches to hunting even before population declines were noted. Common self-imposed conservation techniques followed by this tribe include seasonal rotation of hunting areas; not hunting young animals; not hunting excessively beyond the needs of ones family; not hunting vulnerable species; and the substitution of other activities during certain seasons (fishing/farming). Africa (Botswana) In order to discourage illegal South African hunting parties and ensure future local use and sustainability, indigenous hunters in Botswana began lobbying for and implementing conservation practices in the 1960S. The Fauna Preservation Society of Ngamiland (FPS) was formed in 1962 by the husband and wife team: Robert Kay and June Kay, environmentalists working in conjunction with the Batawana tribes to preserve wildlife habitat. The FPS promotes habitat conservation and provides local education for preservation of wildlife. Conservation initiatives were met with strong opposition from the Botswana government because of the monies tied to big-game hunting. In 1963, BaTawanga Chiefs and tribal hunter/adventurers in conjunction with the FPS founded Moremi National Park and Wildlife Refuge, the first area to be set aside by tribal people rather than governmental forces. Moremi National Park is home to a variety of wildlife, including lions, giraffes, elephants, buffalo, zebra, cheetahs and antelope, and covers an area of 3, 000 square kilometers. Most of the groups involved with establishing this protected land were involved with hunting and were motivated by their personal observations of declining wildlife and habitat.

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**Forest Conservation**  
  
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Forest Management is the branch of forestry concerned with the overall administrative, economic, legal, and social aspects and with the essentially scientific and technical aspects, especially silviculture, protection, and forest regulation. This includes management for aesthetics, fish, recreation, urban values, water, wilderness, wildlife, wood products, and other forest resource values. Management can be based on conservation, economics, or a mixture of the two. Techniques include the extraction timber, planting and replanting of various species, cutting roads and pathways through forests, and preventing of fire. In developed countries, the environment has increased public awareness of natural resource policy, including forest management. As a direct result, primary concerns regarding forest management have shifted from the extraction of timber to other forest resources including wildlife, watershed management, and recreation. This shift in public values has also caused many in the public to mistrust resource management professionals. Community Forestry Community Forestry has been considered one of the most promising options of combining forest conservation with rural development and poverty reduction objectives. Community Forestry is implemented firstly through the establishment of a legal and institutional framework including the revision of legal norms and regulations for forest management, the development of National Forest Plans and the strengthening of decentralization processes to sub-national levels of government. The second principle line of action is the implementation of pilot projects to demonstrate the feasibility of the Community Forestry Framework. However, a study by the Overseas Development Institute shows that the technical, managerial and financial requirements stipulated by the framework are often incompatible with local realities and interests. A successful legal and institutional framework will incorporate the strengthening of existing institutions and enable the dissemination of locally appropriate practices as well as the local capacity for regulation and control Forest Farming Forest farming is an agroforestry practice characterized by the four “I's” -Intentional, Integrated, Intensive and Interactive management of an existing forested ecosystem wherein forest health is of paramount concern. It is neither forestry nor farming in the traditional sense. Forest farm management principles constitute an ecological approach to forest management through efforts to find a balance between conservation of native biodiversity and wildlife habitat within the forest and limited, judicious utilization of the forest's varied resources. It attempts to bring secondary growth forests that have been overused and whose ecosystems have become so fragmented that their natural processes are out of equilibrium, back into ecological balance through careful, intentional manipulation over time, emulating natural processes to restore original, natural diversity of species and ecosystem stability. In some instances, the intentional introduction of native or native-related species for use as botanicals, medicinals or food products is accomplished, utilizing the existing forest ecosystem to aid in support of their growth. The tree cover, soil type, water supply, landform and other site characteristics determine what species will thrive, as opposed to field-grown crop plantings. Developing an understanding of species/site relationships as well as understanding the site limitations is necessary in order to utilize these resources for current needs, while conserving adequate resources for the health of the forest today and for the future. Forest farm management methods may include: Intensive, yet cautious thinning of overstocked, suppressed tree stands such that no individual species is decimated and such that the crown cover is never depleted leaving the forest floor exposed to excessive sun, rain and erosion; multiple Integrated entries to accomplish thinnings so that the systemic shock is not so great; and Interactive management to maintain a cross-section of healthy trees and shrubs of all ages and species, rather than a monoculture of timber species. Caution is used to ensure that physical disturbance to the surrounding area is minimized in order for the forest ecosystem to recover more quickly. Forest farm management is a type of forest stewardship ethic whose philosophy is that the term “sustainable” means what is sustainable for the earth, not what is sustainable for man's demand, and its objective is to restore and maintain the health of the forest land's many and varied ecosystems. In recent years, the concept of ecosystem serviceshas been developed to satisfy the human demand for a means of participating actively in support of ecosystem health and appreciation of the earth's natural assets. This movement is taking many physical forms-the planting of trees; the leaving of timber to grow older; the protection of forest habitat for animal species; creek riparian enhancement. Forest health is already a priority and is currently undertaken on forest farms as part of the management program. This positions them well to respond to this societal need, of conservation-minded individuals who are willing to provide monetary support for the program.

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**Plantation**  
  
A plantation is a large farm or estate, usually in a tropical or subtropical country, where crops that are not consumed for food are grown for sale in distant markets, rather than for local consumption. Such crops include cotton, coffee, tobacco, sugar cane, sisal, and variou oil seeds and rubber trees. Farms that produce alfalfa, Lespedeza, clover, and other forage crops are usually not called plantations. The term “plantation” has usually not included large orchards, but has included the planting of trees for lumber. A plantation is always a monoculture over a large area and does not include extensive naturaly occurring stands of plants that have economic value. The use of the term is governed by the linguistic conventions of natural language and does not have the rigorous consistency of formal language. One of the earliest examples of a plantation was the latifundia. In antiquity, these produced large quantities of wine and olive oil for export. A plantation efficiently produces its crop because of economy of scale. Protectionist policies and natural comparative advantage have contributed to determining where plantations have been located. Plantation agriculture grew rapidly with the increase in international trade and the development of a worldwide economy that followed the expansion of European colonial empires. Like every economic activity, it has changed over time. Earlier forms of plantation agriculture were associated with large disparities of wealth and income, foreign ownership and political influence, exploitative social systems such as indentured labor, and in the extreme case, an especially pernicious form of slavery. The history of the environmental, social and economic issues relating to plantation agriculture are covered in articles that focus on those subjects. Industrial plantations Industrial plantations are established to produce a high volume of wood in a short period of time. Plantations are grown by state forestry authorities (for example, the Forestry Commission in Britain) and/or the paper and wood industries and other private landowners (such as Weyerhaeuser and International Paper in the United States, Asia Pulp & Paper (APP) in Indonesia). Christmas trees are often grown on plantations as well. In southern and southeastern Asia, rubber, oil palm, and more recently teak plantations have replaced the natural forest. Industrial plantations are actively managed for the commercial production of forest products. Individual blocks are usually even-aged and often consist of just one or two species. The plants used for the plantation are often genetically improved, e. g. The seeds used may originate from seed orchards. These species can be exotic or indigenous. Industrial plantations are usually large-scale. Wood production on a tree plantation is generally higher than that of natural forests. While forests managed for wood production commonly yield between 1 and 3 cubic meters per hectare per year, plantations of fast-growing species commonly yield between 20 and 30 cubic meters or more per hectare annually; a Grand Fir plantation at Craigvinean in Scotland has a growth rate of 34 cubic meters per hectare per year (Aldhous & Low 1974), and Monterey Pine plantations in southern Australia can yield up to 40 cubic meters per hectare per year (Everard & Fourt 1974). In 2000, while plantations accounted for 5% of global forest, it is estimated that they supplied about 35% of the worlds roundwood. Growth cycle In the first year, the ground is prepared usually by some combination of burning, herbicide spraying, and/or cultivation and then saplings are planted by human crew or by machine. The saplings are usually obtained in bulk from industrial nurseries, which may specialize in selective breeding in order to produce fast growing disease-and pest-resistant strains. In the first few years until the canopy closes, the saplings are looked after, and may be dusted or sprayed with fertilizers or pesticides until established. After the canopy closes, with the tree crowns touching each other, the plantation is becoming dense and crowded, and tree growth is slowing due to competition. This stage is termed ‘pole stage’ When competition becomes too intense (for pine trees, when the live crown is less than a third of the tree's total height), it is time to thin out the section. There are several methods for thinning, but where topography permits, the most popular is ‘row-thinning’ where every third or fourth or fifth row of trees is removed, usually with a harvester. Many trees are removed, leaving regular clear lanes through the section so that the remaining trees have room to expand again. The removed trees are delimbed, forwarded to the forest road, loaded onto trucks, and sent to a mill. A typical pole stage plantation tree is 7 − 30 cm in diameter at breast height (dbh). Such trees are sometimes not suitable for timber, but are used as pulp for paper and particleboard, and as chips for oriented strand board. As the trees grow and become dense and crowded again, the thinning process is repeated. Depending on growth rate and species, trees at this age may be large enough for timber milling; if not, they are again used as pulp and chips. Bushfires pose a high risk to Eucalyptus plantations. Around year 10 − 60 the plantation is now mature and (in economic terms) is falling off the back side of its growth curve. That is to say, it is passing the point of maximum wood growth per hectare per year, and so is ready for the final harvest. All remaining trees are felled, delimbed, and taken to be processed. The ground is cleared, and the cycle is repeated. Some plantation trees, such as pines and eucalyptus, can be at high risk of fire damage because their leaf oils and resins are flammable to the point of a tree being explosive under some conditions. Conversely, an afflicted plantation can in some cases be cleared of pest species cheaply through the use of a prescribed burn, which kills all lesser plants but does not significantly harm the mature trees. Criticism of industrial plantations In contrast to a naturally regenerated forest, plantations are typically grown as even-aged monocultures, primarily for timber production. Plantations are usually monocultures. That is, the same species of tree is planted across a given area, whereas a natural forest would contain a far more diverse range of tree species. Plantations may include tree species that would not naturally occur in the area. They may include unconventional types such as hybrids, and genetically modified trees may be used sometime in the future. Since the primary interest in plantations is to produce wood or pulp, the types of trees found in plantations are those that are best-suited to industrial applications. For example, pine, spruce and eucalyptus are widely planted far beyond their natural range because of their fast growth rate, tolerance of rich oh degraded agricultural land and potential to produce large volumes of raw material for industrial use. Plantations are always young forests in ecological terms. Typically, trees grown in plantations are harvested after 10 to 60 years, rarely up to 120 years. This means that the forests produced by plantations do not contain the type of growth, soil or wildlife typical of old-growth natural forest ecosystems. Most conspicuous is the absence of decaying dead wood, a crucial component of natural forest ecosystems. In the 1970S, Brazil began to establish high-yield, intensively managed, short rotation plantations. These types of plantations are sometimes called fast-wood plantations or fiber farms and often managed on a short-rotation basis, as little as 5 to 15 years. They are becoming more widespread in South America, Asia and other areas. The environmental and social impacts of this type of plantation has caused them to become controversial. In Indonesia, for example, large multi-national pulp companies have harvested large areas of natural forest without regard for regeneration. From 1980 to 2000, about 50% of the 1.4 million hectares of pulpwood plantations in Indonesia have been established on what was formerly natural forest land. The replacement of natural forest with tree plantations has also caused social problems. In some countries, again, notably Indonesia, conversions of natural forest are made with little regard for rights of the local people. Plantations established purely for the production of fiber provide a much narrower range of services than the original natural forest for the local people. India has sought to limit this damage by limiting the amount of land owned by one entity and, as a result, smaller plantations are owned by local farmers who then sell the wood to larger companies. Some large environmental organizations are critical of these high-yield plantations and are running an anti-plantation campaign, notably the Rainforest Action Network and Greenpeace. Farm or home plantations Farm or home plantations are typically established for the production of timber and fire wood for home use and sometimes for sale. Management may be less intensive than with Industrial plantations. In time, this type of plantation can become difficult to distinguish from naturally-regenerated forest. Environmental plantations These may be established for watershed or soil protection. They are established for erosion control, landslide stabilization and windbreaks. Such plantations are established to foster native species and promote forest regeneration on degraded lands as a tool of environmental restoration. Ecological impact Probably the single most important factor a plantation has on the local environment is the site where the plantation is established. If natural forest is cleared for a planted forest then a reduction in biodiversity and loss of habitat will likely result. In some cases, their establishment may involve draining wetlands to replace mixed hardwoods that formerly predominated, with pine species. If a plantation is established on abandoned agricultural land, or highly degraded land, it can result in an increase in both habitat and biodiversity. A planted forest can be profitably established on lands that will not support agriculture or suffer from lack of natural regeneration. The tree species used in a plantation is also an important factor. Where non-native varieties or species are grown, few of the native fauna are adapted to exploit these and further biodiversity loss occurs. However, even non-native tree species may serve as corridors for wildlife and act as a buffer for native forest, reducing edge effect. Once a plantation is established, how it is managed becomes the important environmental factor. The single most important factor of management is the rotation period. Plantations harvested on longer rotation periods (30 years or more) can provide similar benefits to a naturally regenerated forest managed for wood production, on a similar rotation. This is especially true if native species are used. In the case of exotic species, the habitat can be improved significantly if the impact is mitigated by measures such as leaving blocks of native species in the plantation, or retaining corridors of natural forest. In Brazil, similar measures are required by government regulations. Plantations and natural forest loss Many forestry experts claim that the establishment of plantations will reduce or eliminate the need to exploit natural forest for wood production. In principle this is true because due to the high productivity of plantations less land is needed. Many point to the example of New Zealand, where 19% of the forest area provides 99% of the supply of industrial round wood. It has been estimated that the worlds needs for fiber could be met by just 5% of the world forest (Sedjo & Botkin1997). However in practice, plantations are replacing natural forest, for example in Indonesia. According to the FAO, about 7% of the natural closed forest being lost in the tropics is land being converted to plantations. The remaining 93% of the loss is land being converted to agriculture and other uses. Worldwide, an estimated 15% of plantations in tropical countries are established on closed canopy natural forest. In the Kyoto Protocol, there are proposals encouraging the use of plantations to reduce carbon dioxide levels (though this idea is being challenged by some groups on the grounds that the sequestered CO2 is eventually released after harvest).

# Selection Cutting

Selection cutting is the silvicultural practice of harvesting a proportion of the trees in a stand. Selection cutting is the practice of removing mature timber or thinning to improve the timber stand. This system may be used to manage even or uneven-aged stands. Management objectives can include the protection of forest soils, maintenance or improvement of wildlife habitat, the increase of individual stem productivity, encouragement of regeneration/species diversity or the improvement of the visual amenity of plantations. Selection cutting may include opening up areas to allow tree species that require greater light intensity to grow but that are not large enough to meet the legal definition of a clearcut.

Selection cutting it is not recognized as a valid silvilcultural term since it does not define the objectives of cutting, such as, to improve the quality of trees in the residual stand (also known as an “intermediate treatment” ), or for the purposes of regenerating the stand (also known as a “regeneration treatment ‘). The term,” selection--or selective--cutting “means nothing more or less than the fact that someone has designated trees for harvest. Often the term is used to’ selL'the concept of harvesting to reluctant owners who usually then discover--after the fact--that only the best trees were ‘selected'leaving a largely defective stand in its wake. Used correctly, the term’ selection silviculture ‘implies the use of an uneven-aged method--either’ single tree or group selection' --to begin regenerating, or reproducing, a stand usually to more late-successional, or ‘climax’ species. Anyone who uses the term” selection cutting “or” selective harvesting" should be challenged to define his or her terms and, moreover, to identify the overall silvicultural purpose of harvesting trees.

## Single-Tree Selection

The most common type of selection system is Single Tree Selection, in which scattered individual trees are marked and harvested. Typically, in north America, trees are selected for harvest using the Arbogast Method (after the method's creator). This is also known as the DBq method. Under this method, a harvest is specified by defining a maximum diameter (D), a residual basal area (B), and a q-ratio (q). The q-ratio is the ratio of the number of trees in a diameter class to the number of trees in the next larger class. Typically diameter classes are either 4 centimeters or 2 inches.

Given the required DBq, a residual curve is computed. This tells the forester how many trees in each size-class should remain in the stand. An inventory of the stand is conducted, and excess trees are marked for harvest. The goal here is to regulate the diameter distribution into a form that is known to be sustainable. A distribution is sustainable if enough trees remain post-harvest that they can grow back all that was harvested before the next harvest. Sustainable distributions can provide a steady even-flow of timber over an infinitely long time-horizon.

Conducting a full stand inventory is rarely practical, and tracking the number of trees in small size-classes is tedious in the field. A typical single-tree selection harvest will involve an inventory from a number of sample plots, which is used to estimate which size-classes contain excess trees. Based on this estimate, and the smooth residual curve, a marking-guide is constructed based on larger, more tractable size-classes.

On the ground, the forester will use the techniques of Bitterlich Sampling to determine the basal area around a fixed point. If it is higher than the desired residual, trees are marked to bring it down. Whenever possible, they are marked from the surplus classes indicated on the marking guide. The result matches very closely the one given by a full inventory, but is much faster and more practical.

If production of high-quality sawlogs is a management goal, then crop tree management may be an appropriate technique. Under this method the highest grade trees are selected and then “released” by removing lower grade trees which would otherwise compete with the selected tree for sunlight and water. The selected tree is frequently pruned to grow logs with maximum value.

A similar approach, known as the ‘Frame Tree’ system, is employed in Western Europe. A number of high quality stems are identified at an early stage of the stand development and successive thinning interventions are aimed at releasing the growth potential of these trees. Commonly the final crop trees are harvested when they reach a specified size in order to maximize the financial return to the grower. Throughout the process natural regeneration is encouraged to infill the ground that has been opened up. This “continuous cover” approach can be seen as an alternative to clearfelling.

Another common but sometimes controversial method of selection is diameter limit, the removal of all trees above a certain diameter. Poorly planned diameter limit cutting is considered high-grading by some.

## Group Selection

A popular variation of Single-Tree selection is Group Selection. Under this system, a number of ‘group openings’ are created in addition to the harvest of scattered individual trees. If the groups created are large enough, and if seed-bed conditions are favorable, this can allow species which are intolerant of shade to regenerate. Under typical single-tree selection, it is rare for shade-intolerant species to do well.

Sometimes these group openings can be quite large, prompting critics to say that group selection is tantamount clearcut.

## Overstory removal

Overstory removal or shelterwood cutting is a variation of selection cutting. In this method all the large trees are taken and the understory of saplings and smaller trees are left for regeneration. Overstory removal requires care be used to avoid residual stand damage.

At least in the midwest region of the US, it is typical for shelterwood cuts to be a two-step process. The first step is a thinning down to ~75% crown cover. This provides growing space for new and vigorous regeneration, without removing the benefits of a forest-floor micro-climate and abundant seed source. After the new regeneration layer is well established (25 − 30 years), the residual overstory from the first step is removed. Once this new tree layer reaches maturity, the process is repeated.

The retained trees can be damaged by and otherwise impede the logging operation, necessitating a higher density of logging roads and skid trails. Depending on the regional topography, it is sometimes economical to use cable logging or helicopter logging as an alternative to skidding logs.

## High-Grading

The practice of high-grading, which targets only the highest-quality trees, is commonly confused with Selection System Silviculture. This gives higher income at first but lowers the quality of the remaining forest by leaving undesirable tree species standing, as well as poorly formed trees from desirable species. This can create conditions where no substantial quality timber will naturally grow for many decades.

High-grading most often occurs when foresters employed by the logging company mark the stand or in cases where no forester is employed. The logging company gets more profit from a higher-volume harvest, so it is in their economic best interest to take as much as they can. A small minority of logging companies operate this way; it is by no means the norm. However, the effects of this mistreatment are long-lasting, so only a few ‘rogue’ companies can do quite a bit of damage to the landscape.

One way to avoid high-grading is to contract with an independent forester to mark the stand. Typically marking contracts pay the forester a flat-fee for any marking job. This removes the economic incentive to over-harvest a stand. More than that, there's an economic incentive to practice responsible management so that the forester might receive another contract the next time a particular stand is harvested.

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**Silviculture**  
  
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Silviculture is the art and science of controlling the establishment, growth, composition, health, and quality of forests to meet diverse needs and values of the many landowners, societies and cultures. Regeneration Forest regeneration is the act of renewing tree cover by establishing young trees naturally or artificially, generally promptly after the previous stand or forest has been removed. The method, species, and density are chosen to meet the goal of the landowner. Forest regeneration includes practices such as changes in tree plant density through human-assisted natural regeneration, enrichment planting, reduced grazing of forested savannas, and changes in tree provenances/genetics or tree species. “Human-assisted natural regeneration” means establishment of a forest age class from natural seeding or sprouting after harvesting through selection cutting, shelter (or seed-tree) harvest, soil preparation, or restricting the size of a clear-cut stand to secure natural regeneration from surrounding trees. “Enrichment planting” means increasing the planting density (i.e.. the numbers of plants per hectare) in an already growing forest stand." Common methods Silvicultural regeneration methods combine both the harvest of the timber on the stand and re-establishment of the forest. The proper practice of sustainable forestry should mitigate the potential negative impacts, but all harvest methods will have some impacts on the land and residual stand. The practice of sustainable forestry limits the impacts such that the values of the forest are maintained in-perpetuity. There are five different regeneration methods: Single-tree selection-The single-tree selection method is an uneven-aged regeneration method most suitable when shade tolerant species regeneration is desired. It is typical for older and diseased species to be removed, thus thining the stand and allowing for younger healthy trees to grow. Single-tree selection can be very difficult to implement in dense or sensitive stands and residual stand damage can occur. Group selection-The group selection method is an uneven-aged regeneration method that can be used when mid-tolerant species regeneration is desired. The group selection method can still result in residual stand damage in dense stands, however directional falling can minimize the damage. Additionally, foresters can select across the range of diameter classes in the stand and maintain a mosaic of age and diameter classes. Clearcut-An even-aged regeneration method that can employ either natural or artificial regeneration. Clear cutting can be biologically appropriate with species that typically regenerate from stand replacing fires, such as lodgepole pine (Pinus contorta). Alternatively, clearcutting can change the dominating species on a stand with the introduction of non-native and invasive species as was shown at the Blodgett Experimental Forest near Georgetown California. Additionally, clearcutting can prolong slash decomposition, expose soil to erosion, impact visual appeal of a landscape and remove essential wildlife habitat. It is particularly useful in regeneration of tree species such as Douglas-fir which is shade intolerant. Seed-tree-An even-aged regeneration method that retains widely spaced residual trees in order to provide uniform seed dispersal across a harvested area. In the seed-tree method, 2 − 12 seed trees per acre (5 − 30/Ha) are left standing in order to regenerate the forest. They will be retained until regeneration has become established at which point they may be removed. It may not always be economically viable or biologically desirable to re-enter the stand to remove the remaining seed trees. Seed tree cuts can also be viewed as a clearcut with natural regeneration and can also have all of the problems associated with clearcutting. This method is most suited for light seeded species and those not prone to windthrow. Shelterwood-A regeneration method that removes trees in a series of three harvests: Preparatory cut Establishment cut Removal cut. The method's objective is establish new forest reproduction under the shelter of the retained trees. Unlike the seed tree method, residual trees alter understory environmental conditions (i.e.. Sunlight, temperature, and moisture) that influence tree seedling growth. Other Methods Intermediate stand treatments Release treatments Weeding: A treatment implemented during a stand's seedling stage which removes or reduces herbaceous or woody shrub competition. Cleaning: Release of select saplings from competition by overtopping trees of a comparable age. The treatment favors trees of a desired species and stem quality. Liberation Cutting: A treatment that releases tree seedling or saplings by removing older overtopping trees. Thinning The goal of thinning is to control the amount and distribution of available growing space. By altering stand density, foresters can influence the growth, quality, and health of residual trees. It also provides an opportunity to capture mortality and cull the commercially less desirable, usually smaller and malformed, trees. Unlike regeneration treatments, thinnings are not intended to establish a new tree crop or create permanent canopy openings. Common thinning methods: Low Thinning (thinning from below or German thinning) Crown Thinning (thinning from above or French method) Selection Thinning (thinning of dominants or Borggreve method) Mechanical Thinning (row thinning or geometric thinning) Free Thinning Ecological thinning is where the primary aim of forest thinning is to increase growth of selected trees, favoring development of wildlife habitat (such as hollows) rather than focusing on increased timber yields. Ecological thinning can be considered a new approach to landscape restoration for some types of eucalypt forests and woodlands in Australia. Pruning Pruning, as a silvicultural practice, refers to the removal of the lower branches of the young trees so clear knot free wood can subsequently grow over the branch stubs. Clear knot-free lumber has a higher value. Pruning has been extensively carried out in the Radiata pine plantations of New Zealand and Chile, however the development of Finger joint technology in the production of lumber and mouldings has led to many forestry companies reconsidering their pruning practices. Latest @ IFS: IFS screening (prelims) 2014 results and next steps. Next steps are given below. (on Oct 14, 2014 — Under Secretary [(IFoS], Union Public Service Commission, Dholpur House, Shahjahan Road, New Delhi-110069) Results can be found on the following link. The candidature of these candidates is provisional. In accordance with the Rules of the Examination, all these candidates have to apply ...