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September 5, 1979

Mr. Donald R. Yeaman
Agriculture Development Officer
Agency for International Development
American Embassy, P. O. Box 29
Damascus, S.A.R.

Dear Don:

Attached is the report on the forest fire study of Syria with my recommendations. With the recommendations are explanations of each with reasons why I believe it is needed. I have also written an explanation on how various forestry activities are done at present as I understand them from talking with many people in the field and some in Damascus.

As you will recall, I was in Damascus for two days at the start of my assignment meeting government officials, helping prepare a field schedule in the Directorate of Forests and other preparations in your office. I then went north with you to Lattakia, the headquarters for the most important of their five field districts. With the assistance of Juber Kheir Beks, Chief for the Agriculture Ministry there, and George Kadah, head of Forestry, we worked out a more comprehensive plan and field schedule which was modified several times later.

I then spent ten days in the forest area northeast of Lattakia, headquartering at Kassab. Men from the Lattakia office who took me to field locations were Ahmad Hamoudy who handles fire protection along with other duties and George Barakat, a non-fire man, who acted as interpreter. Much of the time we had a driver and vehicle from the Damascus headquarters, and Mohamed Melhim of the national headquarters who served as my counterpart.

While in the Kassab area we visited several fire towers, some small field stations of guards and some larger headquarters with fire crews and tool caches. We saw wood cutting operations, recreation areas, and several fires that had burned previously. I got a good idea of the forest cover, fuels, topography, weather conditions and other factors that affect the fire situation. I then moved back to Lattakia for work in the district office and to visit areas south and east. We made a trip south to Tartous for two days. One trip was east to Prophet Younis Mountain area. In and around Lattakia we visited the Kinnadi Nursery, the largest tree nursery in Syria, a veneer and prestboard factory and the Regional Forestry School. I came back to Damascus by bus August 10 to complete my report and do other closing out duties.

Wherever I went I found the local people hospitable and forest officials anxious to provide information and help me in any matter they could. Although the fire personnel need better equipment and other facilities, they do a good job of putting out fires with what they have. Considering the fire problems of a long season, dry climate in the summer, steep topography, poor areas and similar situations, they work hard and have

a good record. I believe if they can obtain the equipment I have recommended and carry out several new management practices they will be able to materially better their record.

I appreciate the help and backing given my project by A. M. Hamid, Director of Forestry, his staff and the Agriculture Ministry. Mohamed Melhim, my counterpart worked hard to be sure I saw what I wanted to see and met the necessary people. You and your staff were most helpful to me in arranging my trip, helping with the report and in handling other details. Please thank them again for making my stay in Syria pleasant and I hope fruitful.

Sincerely,

Merle S. Lowden
Forest Fire Consultant

A STUDY OF
FOREST FIRE PROTECTION IN SYRIA

By Merle S. Lowden
Forest Fire Consultant

Study made for: AGENCY FOR INTERNATIONAL DEVELOPMENT

Project No. 276-001 (Forest Fire Fighting)

Contract No. AID/NE-C-1636 (Syria)

INTRODUCTION

The forests of Syria are very important to its people. Each year many forest fires burn large areas and destroy many trees and other values. These fires take away the home for wildlife, make areas unusable for recreation and lower the worth of the forest for livestock grazing and to prevent floods and soil erosion. It is important to have good fire protection to prevent these annual losses.

There has been a fire protection system for the forests of Syria for a long time. Possibly as many as 70 years ago such a system was started by the French. The exact acreage of land that needs fire protection has not been determined but it has been estimated to be more than 300,000 hectares and possibly as much as 500,000 hectares. Many new forests have been planted recently and a much larger afforestation program is planned for the next few years. About thirty million trees will be planted in the 1979-80 planting year.

Much wood and other forest products are now imported from other countries. Wood and wood products including furniture to the value of 231,570,000 Syrian Pounds was imported in 1977. Ultimately much of this wood could be produced in Syria. For all of these reasons forests are important. It seemed desirable to conduct a study to learn what should be done to improve forest fire protection and reduce losses.

This study was done in July and August 1979. Recommendations for actions are given and an explanation is made why each is needed. There is also a statement of the main fire protection activities as they are now done and a background given of conditions and programs existing pertaining to forestry.

RECOMMENDATIONS FOR FOREST FIRE PROTECTION

Number 1

Plan a radio system for field fire guards and crews and obtain the equipment to put it into effect.

A radio specialist should plan the type of equipment needed and its placement. There should be a base radio set at Lattakia and other district headquarters and a set for each field station including towers. Mobile units should be provided for each vehicle used by fire supervisors, guards and crews on fire work. Because of the mountain terrain some relay stations likely will be needed. Portable sets of the handi-talkie type are needed by guards but it is not necessary for each guard to have one. At least 10 portable sets should be made available.

The present telephone system connecting field stations with headquarters is very inadequate. It frequently is not possible to get messages through satisfactorily. There is presently no communication for guards or crews away from stations such as when they are at fires or on work projects. Mobile sets in vehicles and portable sets for guards would permit communications between fires and headquarter stations for better management of fire fighting. Crews of laborers could accomplish more work as they could be reached and sent to fires when on work projects.

Number 2

Obtain vehicles to haul water and to provide transportation for fire supervisor and men at each important field station. This would require about 60 vehicles.

A reliable vehicle is needed at most stations to transport men, equipment and water. The only stations that have them now are those with large crews which have three-ton Mazda trucks on loan from the Agriculture Ministry. At stations with a small crew a pickup would be satisfactory. Men at stations with no vehicles must now walk to fires or be taken by a truck from another station. This means there is often a long time interval between the time a fire is discovered and when the men get to a fire to fight it. If men could get to fires more quickly they could keep the fires to small size and reduce losses. Ten larger trucks are needed to haul water and other fire materials as well as to haul the larger crews.

Number 3

Arrange to use aircraft of other Government Agencies.

Helicopters of the military could be used to haul water or water and chemicals to put on fires if arrangements could be made to do this. Aircraft of the Ministry of Agriculture used for other purposes might also be

changed for use in application of water and chemicals to fires. Planes should be able to haul 2000 liters in a load to be effective to use on fires.

Fire fighting chemicals added to water increase the effectiveness of water many times and help greatly to put out a fire. The mixture of water and chemicals can be used directly on the flame to put it out or put as a line in advance of the flame. The flame will not burn through the chemical on the ground and the fire is stopped. Such chemicals can be used only with water. Chemicals can be applied effectively from aircraft or from vehicles on the ground using a motorized pump.

Number 4

Acquire new equipment for firefighting.

Equipment is very much needed for applying water to fires from the ground such as backpack hand pumps and large tanks with power pumps. The backpacks can be either metal or plastic-canvas type. There are many good types of power pumps which can be used with either slipon tanks or with made-up tanker-pumper units. Tanks can be either neoprene bag type or flexiglass construction and of a size to fit the capacity of the vehicle. Up to 200 gallon (800 liter) for units of 1 ton or under and up to 500 gallon (2000 liter) for units of more than 1 ton. The slipon units are favored as they can be used with many different sizes of trucks now being used or to be obtained. They are also easier to use and give less problems in operation and maintenance.

Syria forestry should have at least 50 of the backpack pump units and 10 power pumps with tanks and accessories kits. The latter should include for each unit 200 meters of 3 cm. hose, two nozzles, two shut-off valves and several wrenches.

New types of hand tools should be obtained. They would be better to work with than present tools which are mostly old and in poor condition. I recommend obtaining 10 drip torches, 400 new heavy hoes, 50 pulaski tools, 100 fire shovels and 100 flaps. They should be divided among the field stations with most going to those with large crews. These would supplement the better sickles, shovels, hoes and pruners now on hand that could be kept. Large first aid kits should be obtained for each truck unit which would require ten. Smaller first aid kits should be obtained for all other vehicles and each station. (See Appendix for complete listing of tool needs.)

Better storage racks and bins for hand tools are needed at the stations and for hauling tools on the trucks. Better care and maintenance is needed for all tools. They should be kept clean, sharp and in good order. Better tools and better care would make the guards and laborers have pride in their tools and have better morale.

Number 5

Undertake a research and fire study program

This should include study of actions on previous fires from the reports.

Some changes are needed in the information required on the fire report. The time the first fire fighter gets to the fire is needed. This would show how long it takes for men to get to each fire after it is discovered. The report should show who reported it, that is, whether a towerman, traveler, farmer or other. The distance of the fire from a road would be helpful in determining how many fires could be reached by power water equipment. Other studies needed include:

- a) What time of day do most fires start? A study of fire reports might show that not enough are discovered at night (8 p.m. to 8 a.m.) to justify men on tower at night.
- b) Who discovers the fire? What towers are discovering fires first? How many fires are towermen discovering as compared to travelers, farmers etc.? More places may be needed where travelers can report fires personally or by telephone.
- c) Who start the fires? Is more prevention work needed with certain classes of people according to occupation, age and where they live? What is the best prevention method to prevent each type of fire?
- d) How long does it take to get crews to fires in remote places? Are more roads or stations needed in some places? It would take a thorough study to determine just what roads and how many more are needed.
- e) Study the exact weather conditions when most fires start and spread rapidly. Work toward developing a simple fire danger rating system which would alert the fire protection manager and guards when conditions will be worse. Manager could increase preparations and prevention work under such conditions. More use of currently obtained weather information is needed.
- f) Conduct a study of intentionally burning a few areas to reduce the fire hazard. These should be in pine areas and not during critical periods. Such fires would remove the needles, annual weed and grass growth and make the forest less likely to burn severely at some other time. These study areas should be carefully selected and the test fires done within control lines built in advance so the fire will not escape. Test areas should not be more than 1 hectare in size.

Number 6

Increase fire prevention work and try some new methods

Signs

It would be desirable to replace the older fire prevention signs on roads with new ones and to use more illustrations such as symbols in the signs. Travelers get accustomed to seeing the same signs on roads and pay less attention to them, particularly if they are faded and hard to

read. Strangers often go too fast to read signs with just words on them.

Specific action symbols or pictures such as putting out a campfire, crushing a cigarette or building a safe trash fire would be good to use as prevention signs. Some of these should be put in areas where people camp or have picnics. They have time there to read and study the signs.

Use of media

Messages on the radio and TV warning people about forest fires particularly during dangerous periods in the fall of the year should be used. Radios are widely listened to throughout the country and there are now many TV sets.

A new leaflet on prevention with a different message and illustrations would give people something new to see on prevention. It should stress the importance of the forests of Syria to its people and particularly the need to protect the new trees being planted. Specific material directed at school children should be prepared and distributed. Possibly some commercial company would include such material in their advertising or make special material for this use.

Determining causes

More attention should be given to determining the cause of each fire. The most likely cause should be given if the exact cause is not known. It is difficult to determine exact causes. Having so many fires in the "unknown" class is not helpful in planning prevention. Forest guards and fire leaders should be involved in investigations of all fires as well as the police. The forestry men will get information on fire causes that will help in planning and doing prevention.

Recreation areas

More places along highways should be designated as picnic and camping places and be made safe from a fire standpoint. If these were equipped with tables, benches and water people would stop there rather than other places. These areas should have cans or containers to put papers and other waste which now accumulates on the ground. This is a fire hazard. Such places should be cleaned up regularly. It would be well to build a fire trench around the areas so if a fire did start it would not spread to the surrounding forest.

Number 7

Plan and carry out a training program for fire people. This should be directed at two groups:

a) Fire protection leaders or managers

Some of this training can be done in Syria and some best by sending a few people to other countries with forest fire work similar to Syria.

- (1) Within the country a training meeting for fire managers (mostly forest rangers) should include prevention work, fire behavior, fire fighting methods, planning work for crews and administrative matters such as reports. It would be good to hold this at the Regional Forestry Training Center either separately or in combination with some of their fire protection training.

As Syria contributes to the school a cooperative fire course with them would be good if it can be arranged. Forestry fire people to be trained at such a course should include not more than 15-20 fire leaders. Leaders at the Regional Training School are interested in helping on a special fire course.

- (2) Assignment abroad should be arranged for at least three fire men for a few months or a year. Such assignments should be to an area with forests similar to Syria and be confined to work that would be applicable at home. It should not be directed principally to smokejumping, use of helicopters or complex equipment likely not to be used soon in Syria. One of the men should be a radio man to supervise radio installation and maintenance if radios are acquired for fire use.
- (3) A trip by the Director of Forests or other top leader to a country that is successfully handling its forest fire problems would acquaint that person with the possibilities of things that could be done in Syria to improve forest fire protection.

b) Guards and laborers

This type training should be done in the districts. All guards in a district should be brought together for at least a day at the beginning of each fire year. They could best be separated into new men and experienced men and at least part of the training be different for each group. They should have work in prevention, fire fighting methods, care of tools and equipment and similar subjects. A fire technician from another country could be used to help with this training. (See Recommendation #8)

Number 8

Obtain a fire technician from another country to help fire managers for a few months.

This should be a field experienced man who has worked in a local area with fire problems similar to those of Syria and who knows forest fire technology. He should be available for a 5-7 months period (April-November). He should headquarter at Lattakia or a similar field location. It would be very helpful for the man to have some Arabic background and know Arabic or French. Some of the jobs he would do:

- a) Help plan and instruct at training courses mentioned in Recommendation No. 7 especially in fire fighting methods.
- b) Help do some of the fire studies in Recommendation No. 5.
- c) Spend several days with each large crew to help them to learn use of new tools and practice fireline building, burning out, mopup and other fire fighting techniques.
- d) Work with forest guards on prevention work--- study what they do and suggest new things.
- e) Help in developing and applying a simple fire danger rating system.
- f) Help prepare a handbook on fire protection (as in Recommendation No. 9 c)).

Number 9

Introduce new management practices into fire protection

- a) Establish a division or department of fire protection in the national office at Damascus. The head of this unit would in reality be the national forest fire chief for Syria. At district headquarters have one person assigned the responsibility for fire protection. Where there is not much fire work in a district this person could have other duties.
- b) Have a formal review of each large fire after it is out. Bring together leaders who worked on the fire or had a responsibility in putting it out. Set down what was done and what was done wrong. Make a list of things to be done in the future both before a fire starts and when it is being fought.
- c) Prepare a handbook or guide on fire protection. This would be used by leaders and forest guards. They could refer to it for answers to questions on their work. It should include instructions on fire prevention, fire fighting, weather observations, use and care of hand tools and other equipment, how to investigate fires and how to make out reports.
- d) Prepare a program or plan of jobs needed to be done in fire protection at the national level or by the national office each year. This could be prepared when leaders are together for training or at other times. A similar plan should be prepared for each district.
- e) Prepare a list of work jobs needed at each field station and in each local unit on fire protection. This could include jobs like painting, building a telephone line, fixing a building roof etc. These lists could be used in making up work lists for fire crews.

- f) Build small reservoirs or waterholes along roads for fire purposes and develop more springs. These could be built when roads are opened up. They will provide a place to fill water tanks for fire fighting. The waterholes need not be large.
- g) Plan a system of fire breaks or roads in plantations. These should be low-grade roads so the public will not wish to travel over them. They should be kept open for fire travel and to use to stop fires. Cleanup along heavily used roads would also make them serve better as fire-breaks or places to stop a fire.
- h) Give attention to safety, preventing accidents and first aid for men on fire fighting work. Provide large medical kits for large crews and small ones for each vehicle and station including towers.
- i) Change the fire report form as mentioned in Recommendation No. 5 and develop a size classification for fires. For example fires up to 1 hectare in size could be class I, 1 hectare to 10 hectares class II, 10 hectares to 100 hectares class III and 100 hectares and larger class IV.
- j) Provide incentives for employees to do superior work. These could take the form of increased regular pay, a bonus or cash award, more holiday time or other forms of reward. They would be given for doing one special job in a superior manner or for sustained above-normal performance for a period of time, such as one year.

RECOMMENDATIONS ON AFFORESTATION

Number 1

Give more attention to the type of trees and their location from which seed is obtained.

Seed especially for *Pinus brutia* used in afforestation should come from the best trees in the forest. These should be straight well-formed trees that show the most rapid growth. New trees will be much like their parents and there is need to improve the forest. Many of the trees in the forest now are of poor shape and form. Most seed is gathered where it is most convenient to crews on roads without regard to the individual tree it comes from.

Altitudinal ranges for seed trees should be established. Four such "ranges" could be set as for example: sea level to 300 meters; 300 to 600 meters; 600-1000 meters and 1000 meters and over. Seed should be designated as to what "range" it comes from and the new trees planted in the same altitude "range" the seed came from. It has been found that trees planted in the same general altitudinal "range" as the parent trees grow much better than those from some other "ranges". To do this properly

requires labelling seed in storage as to the "range" it came from and to keep trees from the same "range" separate and marked in the nursery. This is to assure that trees will be planted at the same general elevation in which the parent tree grew.

Number 2

Storage facilities with refrigeration should be built at one or more locations to hold seed from one year to another.

Seed may be planted successfully after several years in cold storage. Now seed must be used the year it is harvested. This means in years when there is less seed the crews gather seed wherever they can get it and often from poorly formed trees. If seed could be held several years it would be possible to use seed from better trees.

Holding seed from one year to another would also make it possible to better plan nursery production for each year and for years ahead. There could be a sure supply of seed for planting each year by gathering more than one year's needs in a "good" seed year. It might take a few years to get a sufficient supply ahead to provide the seed needed for such a program.

Number 3

Establish test plantation of trees from other countries

Several sites at various elevations, slopes and soil conditions should be selected for planting a variety of trees from other countries. This should be done as soon as possible to determine if there are other trees that would grow better in Syria than those now being planted. I suggest especially that monterey pine (*Pinus radiata*) be tried. It has proven very successful in many parts of the world including Australia, Spain, Chile and Brazil.

FOREST OWNERSHIP, POLICY AND USE

All natural timber is owned by the government in Syria. It cannot be cut or removed without permission. The general policy is to save the present forests and to conduct an aggressive program of afforestation and reforestation to build up the forests. Wood is sold for commercial purposes but cutting is aimed as an improvement for the forest. Local land owners can get permission to cut marked trees for their own use without charge.

Farmers cannot run herds of cattle, goats or sheep in the forest but each family is permitted to let a few head go into the forest to graze from homes or from the villages. There is no charge for this use. Older reports and writings mention the damage to the forest from grazing herds

of animals especially goats. This was first prohibited several years ago and does not appear to be a serious problem at present. Some new plantations have been damaged along roads where grazing animals travel but no recent widespread damage to either native timber or planted trees was noted. Grazing of a few livestock helps to lessen the fire hazard by removing grass and other annual growth that causes fires to spread.

Some land use planning in the forest area was done a few years ago in an inventory but there does not appear to be application to it in current use. There appears to be need for a new land use plan for all the forest area.

Some areas are designated and used for camping and picnicing but there are very few developments for people's use other than springs. People can camp only in the designated areas and this is much better than letting them camp just any place. Many places are not safe to camp from a fire standpoint.

ORGANIZATION AND MANAGEMENT

The Directorate of Forestry is part of the Ministry of Agriculture in Syria. It is headed by a Director of Forests and his staff at the central headquarters in Damascus. The staff is divided into three major responsibility areas of (1) Production (including (a) Seeds and Nurseries; (b) Afforestation and (c) Wood Trees and Windbreaks; (2) Utilization and Organization including (a) Organization (b) Utilization and (c) Forest Roads; and (3) Protection and Mapping including (a) Mapping and (b) Protection. No one person is specifically assigned the responsibility for fire protection in the national office.

In the field forest administration is divided into five districts with headquarters at Lattakia, Tartous, Hama, Idleb and Aleppo. Within the districts are subdistricts called Gazas. The smallest organizational unit is that handled out of the small field stations. There are about 70 of these in the country.

Each district has a head forester. He has people to help him (a staff) as needed dependent upon the activities within his district. Fire is included as part of the total protection job. Only at Lattakia district office is there a person given the responsibility for fire protection and that man has some other duties.

The key people in fire protection are the forest guards of whom there are 265 in the country. They enforce the forest law, work on fire prevention and go to and help put out fires. They represent the Forest Directorate in the forest area. Many guards have other specific duties such as supervising the selling of wood from the forest.

A special organization may be needed soon to manage the large planted area in the vicinity of Damascus. Perhaps this should be organized as a

special district. Protection from fire is not a great problem at present but will grow in importance. Special prevention efforts will be needed to assure there are not fires in these plantations as they increase in area and the trees get larger. A special crew will be needed to go to and put out any fires in this area.

Forest guards serve yearlong and are selected by a competitive examination. There were 30 new ones hired in 1979. They must have an elementary school education. The government provides them with a uniform including boots and pays a beginning salary of 300 SP/month. Each two years they get a salary increase of 10 SP/month. Guards are not provided a vehicle. Some guards devote almost all their time in the fire season (about May 1 to November 15) to fire protection but have other duties for the balance of the year.

Detection of fire is mostly done by men on towers but no study has been made of what portion of the fires they actually see first and at what time of day. A study to determine these things and other information is included in the recommendations. There are five manned towers located in the forest area. The new one near the Kouzoldugh tower is to replace the old one as soon as the telephone line is built to it. The change has not been made although it is two years since the new one was completed.

Two men are on duty at each tower continuously. They alternate with two others each 24 hours usually on a 7 p.m. to 7 a.m. basis. The men on the towers do not go to fires and have no transportation. In some cases there are also crew men at a tower as at Bimalhi Tower in the Tartous district.

EQUIPMENT

Communications

The only communication connection from headquarters to field fire stations is by telephone. The present pole-line system is very inadequate for fire protection use. It is often difficult to get messages through by telephone and sometimes the lines go out completely. There are several switching stations which many messages must go through. There is no way at present to contact firemen away from stations on fire fighting, work projects or other duties. A radio network for forest stations and field forces is very much needed.

A radio system would provide communication between fire fighters on a fire and their headquarters. Fire needs could be made known directly and dispatched to the fire. Instructions and help to men at the fire could be sent direct from headquarters to the fire. Men could work on projects with a radio and be immediately available to be dispatched to a fire.

A radio expert should study the system needed and plan the type of equipment and its placement.

Vehicles

There are practically no vehicles at present assigned for fire use. Guards at field stations must walk, ride a bicycle or animal, use public buses or get rides from others to go to a fire or do other duties. A few trucks are on loan to forestry for the fire season to haul crews. Under the current system it may take a long time for men to get to a fire. Trucks with crews may pick up guards enroute or go back and gather them up after taking the first crew to a fire. Field stations with men need vehicles to go to fires. A few special trucks are needed to haul water tanks and power pumps. A special car should always be available at district headquarters to take the fire leader to a fire or to take whomever is to supervise the fire fighting.

Hand Tools and Water Equipment

Fire tools and equipment is very inadequate for fire fighting. Most hand tools are old and in poor condition. They use hand sickles and pruners for cutting brush, hoes, rakes and shovels for digging and axes, hand saws and a few power saws for tree cutting. They have a variety of canteens and water carriers for drinking water. There is no equipment for applying water to fires and this is badly needed. They could haul water in the trucks now available to them but have no suitable large containers.

Present tools are put in piles or scattered in storage buildings and hauled loose in trucks. They are often not clean or sharp. Workers would have more pride in their tools and what they do, if they had new well cared-for tools. Flashlights are available for workers but I found no first aid or medical kits of any type.

New type tools and better ones are needed for the fire fighter. New heavy hoes would be particularly valuable in building fire lines. New tools for Syria such as the pulaski tool, handpumps, flaps and special fire shovels should be tried out and I believe the men would like them. They need torches to burn the material between the fire trench and the fire edge.

Means need to be provided to haul water to apply on fires. Slipons tanks with power pumps are good for this purpose and several are needed. Fire hose and other accessory equipment are needed for the power pumps.

The forest road department has tractors with bulldozer and means for transporting them. They are used on large fires. The military also have similar large equipment. Large equipment is thus available from these sources and additional machinery of this type is not needed for fighting fires. Some cities such as Lattakia will send their water equipment to forest fires which are close to the city but this is not a reliable source for the main forest areas far from the cities.

If arrangements can be made with the military their helicopters could be used on the larger fires to haul water and men. Special tanks carried in slings under the helicopter or tanks attached directly to the fuselage of the helicopter would have to be obtained to haul the water.

FIRE PREVENTION

Preventing fires is mainly done through personal contacts of guards with people and through road signs. Road signs warning about care with fire and to not start fires are nearly all in written word without pictures or illustrations. Local people get used to written signs and may not give much attention to them. Strangers often travel too fast to read signs other than road directions. It would be good to have some signs with how-to-do-it pictures or illustrations such as putting out a small fire, crushing a cigarette, breaking a match or a farmer watching a small clean-up fire with tools and water available.

It is difficult to know how to prevent purposefully set fire except by strict law enforcement. This is the cause of the greatest number of fires in Lattakia district where cause statistics are available. Farmers burning to clear land or to dispose of brush is a cause of large numbers. Guards in their trips can talk to these people and instruct and help them to have tools and water when they burn.

Use of public radio and TV messages needs to be tried. Most families have radios and more are getting TV. They can receive a fire prevention message in that way. The forest men have a good colored illustrated leaflet on prevention which they give to people. These should be more widely distributed to tourists. A new leaflet will be needed soon and should be prepared. People get used to seeing certain printed material and no longer pay attention to it.

Some good prevention work is now done in places or there would be more than the average of 100 per year for the last thirteen years in Syria. However, it is disturbing to note the average number of fires has increased to an average of 119 in the last six years. The high year was 1977 with 153 and the next highest was 1973 with 138. A study should be made (Recommendation No. 5 c)) why there were so many fires in certain years as 1973 and 1977.

Recent increases in fires may be because of more use of the forests by people to camp or picnic or for other reasons. There may be a method of telling what years there will be more fires as when there is a drouth and at those times special and more work should be done on fire prevention.

More picnic and camping spots along roads that are fixed up with benches, tables and water would attract people to stop at such spots rather than other places. People are supposed to clean up their trash in picnic and camping areas but they do not do so. There does not appear to be any program or plan for keeping such areas clean. There is much paper and other trash in these areas as well as elsewhere along roads. Cans or other containers should be placed in recreation areas for people to put their paper and other trash. This would reduce the hazard and the likelihood that fires would start in such places.

FIRE FIGHTING

Forest fire fighters in Syria use the direct fire fighting method almost entirely. They cut the brush and other material along the fire edge and put out the fire by digging it out or putting dirt on it. They do not use the indirect method of building a fire line or trench and then burning out the material between this trench and the fire edge. It would be good if they used the indirect method in many places.

Fires are not usually put out with water as the men do not have containers or tanks to haul water and no pumps to apply water to the flames. They need both tanks and pumps very much. Much good work is done in fire fighting even if they do not have the equipment they need. Workers' efforts show determination and perseverance and they contain many fires at small size.

Cutting of brush and trees is done with hand sickles, axes, hatchets and brush hooks (sickles with handles). Digging of soil to cut off the flames or throw upon the fire is done with shovels, hoes and rakes. The rakes are used mostly to remove the fuel on the ground in advance of the fire edge. Crosscut saws and a few power saws are used to cut down trees or cut through to remove logs on the ground. Newer type and better hand tools would permit the fire fighters to do better work and put out the fires more quickly.

Men go to the fires by walking or in trucks. Stations with a few men do not have trucks and the men must be picked up by trucks from other stations or walk to fires. More vehicles are needed to haul men to fires. At the fires men cannot communicate back to their stations or headquarters. Radios are needed for this purpose.

Much of the firefighting is done by men in crews who work only during the fire season. There are 198 of these men employed. They wear special armbands at the fires which designate them as fire fighters. They receive 11 Syrian pounds per day and work every day in the month. While on fires they receive their meals. The food is brought from the city or villages to feed the men on the fire and they stay on the fire until it is put out. There is a special fund to pay for this food. If the fires get larger, crews are brought from other areas or districts and these stay and sleep on the ground until the fire is out. They work at night as well as the daytime if this is required.

If a fire gets larger than the regular forestry fire crews can handle, the military is brought in to help. They usually work on a special part of the fire and military and civilians are not mixed on a fire. Men can be conscripted or required to fight forest fires and not be paid, but this is usually not necessary. Men are not hired and paid especially to fight a forest fire. When the military is used on a fire they have their own heavy equipment such as trucks and bulldozers but use some forestry hand tools. Special forest fire leaders are assigned to military crews to direct them in fire fighting.

The forestry road department has trucks and bulldozers which are used on the larger fires. They were used very effectively on a large fire near Bassit in July 1979. They built much fireline which became a road around the fire edge that could be driven over.

Few homes have been destroyed by forest fires and men are seldom caught in a fire. In about 1956, eight men were caught and burned in a forest fire. There have been no recent deaths in this manner.

A report is made of each fire. The report is started when a towerman or someone else reports a fire. Several changes to the report are suggested in the Recommendations (No. 5). There is nothing in the report about the size of the fire when the first person got to it, how far it was from the road, who saw it first, or how many people worked on the fire. This would be good information for later study.

There are no handbooks or written instructions on fire protection work. Such a handbook is needed as a guide to the leaders and the forest guards. They could study this book and refer to it for information on how to do various jobs.

FIRE WEATHER

Comprehensive meteorological records are kept at many field stations in the forest area but not much attention seems to be given to the statistics in managing fire protection. There are seven forestry stations in the Lattakia district that report weather readings to headquarters and records are available for several Lattakia city locations. Records are kept yearlong at the forestry stations with some reporting daily and others twice monthly. Data taken includes maximum and minimum temperature, humidity, percent of sunshine, cloud and sky conditions, rainfall through each 24 hours, wind conditions, soil temperature, and thickness of snow.

Readings at most stations are taken at 800, 1400 and 2000 hours. Those that report daily telephone their reports after 2000 hours to Lattakia. The stations have a variety of modern instruments including wet and dry bulb thermometers, rain gauges, anemometers (some locations), soil temperature thermometers for 50 centimeters and one meter, and hygrothermographs.

It is surprising to note the large amount of annual rainfall at some reporting stations but almost all of it comes in the winter months. (See table in appendix). There is a long dry season from May through October which produces the bad forest fire weather and the normal fire season. Records maintained at Lattakia show the following average precipitation 1952-1970: May - 28MM, June - 4MM, July - 0MM, August - 3MM, September - 22MM, October - 55MM, and November - 99MM. The annual average for that period was 760MM per year. However, several forestry stations at higher elevations have more than 1000MM regularly and at times 1500MM and even 1900MM.

The worst part of the fire season normally comes in October or early November before the main rains start. At this season they have dry winds blowing in from the deserts in Eastern Syria. Fire weather should be studied more (see Recommendation No. 5e)), and more attention given to it currently in planning and managing forest fire protection.

FOREST MANAGEMENT AND UTILIZATION

The forest directorate plans the amount of pine wood to be removed each year from certain areas. For example, they plan to sell and cut 8-10,000 tons of wood in the Lattakia district in 1979. This is to meet the needs of the Prestboard factory in Lattakia, other similar plants, and small factories which make mostly box wood. The factories contract with private operators who cut the timber, take it to concentration places (landings) on main road by tractor, and from there by large trucks to the cities. There are no factories in the forests.

Material is cut into relatively short lengths of not less than one meter. Much of it is in the form of an improvement cut from rough and odd-shaped trees. This means some of the material is in more or less chunks. Some of the bark is peeled off at the concentration places.

The trees are cut close to the ground when felled and there is good utilization of the wood. Small limbs and tops not taken by the cutter are often cleaned up and used by local people for fuel or for drying and smoking their tobacco crop. There is no charge to the local people for this material. Trees to be cut are designated and marked by a forester in advance. They use a marker stamp to mark the trees and also the material that is hauled out of the forest. More timber cutting is done in the fall and winter rather than the summer so the men are not working in the woods during the worst fire period.

Wood is paid for to the government by weight and the weighing is done on the trucks in the city. Weight seems a good method of payment as the wood is usually quite dry when weighed and because of the small pieces and odd shapes it would be difficult to measure by any other method.

Wood burned by forest fires is sold if it can be used. A naval stores experiment to take from the forests resin and turpentine was made in 1956. There were good yields from the trees. There has been no further work on such use as there appeared to be worry about the increased danger of fire. A naval stores expert would need to study the situation to determine if it is possible to successfully use the forests for this purpose. It is believed the fire situation could be handled if working the trees was a financial success.

Some work on trees by insects was reported. However, very few dead pine trees were noted in the forests.

An inventory of forest volumes was made several years ago and is available by units. There may be need to bring this up-to-date but there has been no extensive cutting or major changes in the forest in recent years. There has been little conversion from timber use to agriculture use in the last few years.

Present cutting is done chiefly to improve the forest and it would seem more could be done as far as the amount of timber available. There may not be markets at present to take the type of wood available. I noted many telephone and powerline poles being placed in lines in the forest area. This would seem to be a good market for local timber although careful selection of trees would have to be made to get proper sized ones.

The directorate sells 2500 tons of charcoal each year which is made from Querus (oak) usually of a type (small size) not useable for other purposes. There are five main charcoal operations in the country. The wood is cut and burned in kilns in the mountains. The charcoal is brought (often packed by mule or burro) to concentration locations where it is loaded on trucks to be hauled to city markets. There it is weighed. Material is sold by the ton on the basis of four tons of wood makes one ton of charcoal.

TRANSPORTATION SYSTEM

The forest directorate has an extensive system of roads in the country and plans to build more. They have opened a total of 1116 km of roads at present of which 318 km are paved. Within the next three years they plan to open an additional 1035 km and will pave 420 km more. Some roads in the mountains are in poor condition and need to be improved. Travel over the poor roads is slow and this delays the time it takes a crew to reach a fire. Thus some fires can get large because of poor roads.

No apparent effort has been made to make roads for firebreaks. These should be made when large areas are planted and would provide a place to stop a fire. Such breaks should be planned as part of the road system. Most of these should be for fire protection purposes and not to serve the public. I noted no particular cleanup of hazardous fuels being done along roads. This would be a good job for the fire crews when not fighting fires.

AFFORESTATION

Syria is in the middle of a large program of tree planting. They plan to plant approximately 30 million trees in the 1979-80 planting year (October through March). Twenty-four forest nurseries are operated

in the country to produce the trees for this program. The program is planned to be increased in future years. The largest nursery is at Lattakia which will produce about six million trees this year and the second largest is at Tartous planned to produce three million.

The total program includes afforestation in the mountains, windbreak planting by farmers on their lands, and planting along many highways for landscaping and to make a greenbelt near the cities. Foresters and workers have used good procedures in growing planting stock and in doing the actual planting. There are many fine plantations growing in the country. In some of the difficult growing places we visited in the mountains they had a very high percent of the trees that were growing. Planting was difficult and slow in some sites. We did not learn of any surveys made of their success. It would be good to have some record of what they have accomplished in percent of trees that live in the various plantations.

Generally good nursery practices seem to be followed at the Hinnadi and Tartous nursery which we visited. Seed for local species is obtained from local pine forests by the fire crews in June through August. This seed obtained from foreign sources is planted in plastic bags in November. The seedlings are usually planted in the field the next fall and winter (November through March). *Pinus brutia* is the main tree planted in the forest area. It is native and does well. An increasing number of Pinyan pine is being planted to harvest the seed for food (nuts). Much of the seed for it comes from foreign countries, especially France.

Cupressus is grown in many of the nurseries for windbreak planting and roadside use. Trees are provided to farmers at very low cost for planting as windbreaks on their land. Trees for strictly afforestation of areas are furnished to private owners at no cost.

A very large project of planting trees along highways and in certain areas for greenbelts around cities is underway. Examples of this are on the mountain north of Damascus and along the highway north toward Homs. Many of these trees are being watered for the first few years to assure that they will grow. A great variety of different species of trees are being used including both conifer and hardwoods. The Damascus mountain project is a spectacular example of getting trees to grow in a very difficult site. In 1977 Jordan gave Syria 200,000 trees from their nurseries to plant in Syria. These were mostly *Cupressus*.

Much of the pine forest is composed of trees of poor form with many crooks and strange shapes. Some of this was caused by the practice of cutting tops out of trees to use for smoking tobacco by farmers years ago. There are various theories advanced as to other causes of the poor shape and the few straight trees. It could be a gradual genetic degradation over centuries. Occupation forces cut the forests of Syria for many years by taking out the better trees as did local people. There is need to build up better forests through obtaining seed from better trees, removing poorly formed trees and replacing them with better ones and gradually build back to a better stand. Some of the sites are poor with scarce soil but it is doubtful if this is the full reason for the poor form of the trees.

ARAB FORESTRY INSTITUTE
P. O. Box 142
Lattakia, S.A.R.

Dr. Adnan El-Fares, Director

Ahmad Abbas, Assistant Director

This two-year forestry institute was started and helped financially by FAO for a number of years. Then the Arab League put in funds to support the institute for a period. Now it is largely up to each country that sends students to support them financially. It costs more than \$1000/year for each student. Leaders of the institute have difficulties in finding funds to keep it operating at present.

There are usually about 90 students enrolled at the school with 45 starting each year. The school year runs from September to May. Each summer they have a field school for a short time. In 1978 the summer school was in Jordan and this year in Iraq. Countries which send students include Syria, Jordan, Lebanon, Iraq and Tanzania. Director Adnan El-Fares would like to hold specialized courses in subjects such as nursery practice, fire protection and utilization if he could get interest in the countries to send students.

Students are housed at the institute with dormitories on the second floor and classrooms on the ground floor. A restaurant is available on the grounds for meals. They have a limited library and equipment such as movie and slide projectors. It is possible to take students to the field for practice such as fire protection and to the Hinnadi Tree Nursery which is only a few kilometers away for nursery instructions.

Director El-Fares would be interested in making arrangements with the Directorate of Forests to hold a special fire training course for their people at the institute. It might be possible to include fire people from some neighboring countries in such a course.

APPENDIX

1. Forest Fires in Syria 1966-1978
2. Fires by Causes - Lattakia District 1966-1978
3. Rainfall in the Lattakia District 1975-1979
4. Equipment Needs for Fire Protection - UAR

FOREST FIRES IN SYRIA
1966-1978

<u>YEAR</u>	<u>NO. FIRES</u>	<u>AREA/H</u>	<u>LOSSES</u>		
			<u>WOOD TONS</u>	<u>TREES NUMBER</u>	<u>LOSSES IN SYRIAN POUNDS</u>
1966	88	70.7	2276	11298	1,487,873
1967	42	62.7	92	6982	285,514
1968	96	326.4	285	11777	909,367
1969	83	263.3	3969	31836	969,065
1970	122	473.0	871	38020	2,197,452
1971	56	315.4	1214	46129	2,148,973
1972	97	542.6	7537	139552	4,342,310
1973	138	808.7	3592	133012	6,165,496
1974	110	626.4	2972	435517	6,876,480
1975	98	120.0	280	111512	487,789
1976	115	180.5	73386	45728	705,066
1977	153	536.1	1429	202502	2,234,209
1978	103	485.5	912	197773	6,885,223
AVERAGE	100	370	7601	108587	2,745,755

FIRES BY CAUSES
LATTAKIA DISTRICT 1966-1978

<u>YEAR</u>	<u>CLEARING LAND</u>	<u>SMOKING</u>	<u>LIGHTNING</u>	<u>UNKNOWN</u>	<u>ARSON</u>	<u>TOTAL</u>
1966	19	3	-	19	8	46
1967	7	3	-	11	8	29
1968	19	5	-	29	11	64
1969	1	3	-	8	1	13
1970	3	1	-	17	1	22
1971	-	-	-	18	-	18
1972	2	7	-	24	13	49
1973	8	2	-	13	29	52
1974	-	1	-	11	15	52
1975	2	1	2	12	7	24
1976	6	-	-	6	11	23
1977	2	5	-	10	8	25
1978	1	1	-	29	15	46
TOTAL	70	28	2	207	127	438
AVERAGE	5.4	2.2	.15	15.9	9.8	33.7

RAINFALL IN THE LATAKIA DISTRICT
1975-1979

<u>NAME OF STATION IN FOREST AREA</u>	<u>ELEVATION IN M (APPROX.)</u>	<u>RAINFALL BY MM FOR YEARS</u>				<u>AVERAGE</u>
		<u>75-76</u>	<u>76-77</u>	<u>77-78</u>	<u>78-79</u>	
Castal Maaf	450	1404	1541	1313	1010	1317
Wadi Kendil	150	931	1212	1110	685	984
Zahio	600	1432	1499	1513	1101	1386
Gouledt Bourghel	900	1591	--	--	--	--
Rerdohor	300	934	1120	--	--	--
Kassab	750	1958	1850	1526	1182	1629
Haffe	350	1216	1220	--	862	1099
Deile	50	809	1146	990	770	929

EQUIPMENT NEEDS FOR FIRE PROTECTION

Directorate of Forests - UAR

<u>Item</u>	<u>Size/Type</u>	<u>No. Units</u>	<u>Unit Cost¹⁾ In U.S. Dollars</u>	<u>Total Cost</u>
Vehicle	1/2 - 3/4 T (Land Rover or Equivalent)	50	10,000	500,000
Vehicle	2 T w/winch	10	15,000	150,000
Radios	Station (Headquarter)	6	4,000	24,000
	Field Station	70	3,000	210,000
	Mobile	60	2,000	120,000
	Portable	10	1,000	10,000
	Repair Kit	1	5,000	5,000
Water Pumps	Motor	10	1,200	12,000
Hose	Kits - 300M 3cm	10	700	7,000
	Nozzle, valves, wrenches (kits)	10	400	4,000
Water Pumps	Hand - 20 liter	50	50	2,500
Water Tanks	400 liter	5	800	4,000
Water Tanks	2,000 liter	5	1,200	6,000
Water Tanks	800 liter (for helicopter use)	2	3,000	6,000
Hand Tools	Hoes (heavy)	400	18	7,200
	Pulaski	50	15	750
	Fire Shovels	100	8	800
	Flaps	100	15	1,500
	Drip Torches	10	80	800
First Aid	Large Kits	10	100	1,000
(Medical)	Small Kits	100	10	1,000
TOTAL				\$1,073,550

1) Prices obtained from U. S. Forest Service, U. S. General Service Administration, suppliers and other sources. They include critical replacement parts to be supplied with units. Contracts and purchase orders should include such parts in the specifications and requirements.