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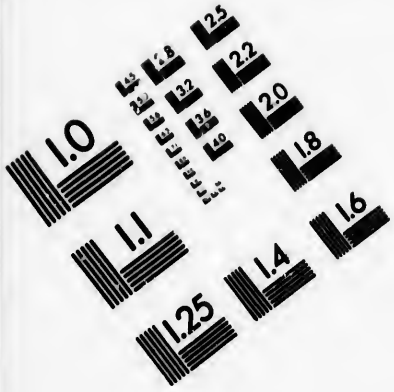

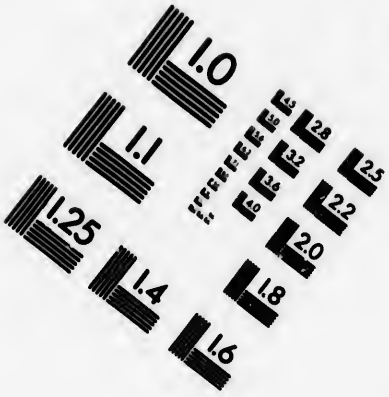

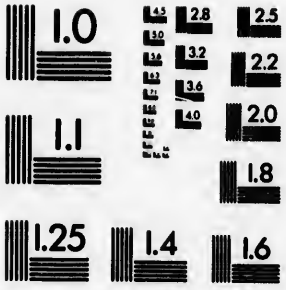

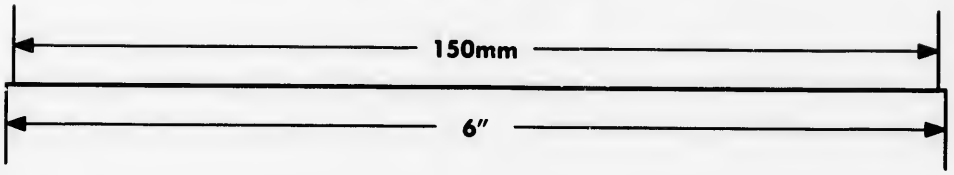

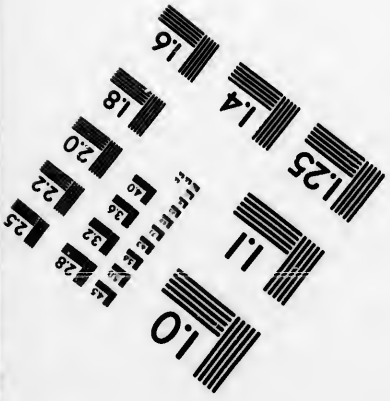

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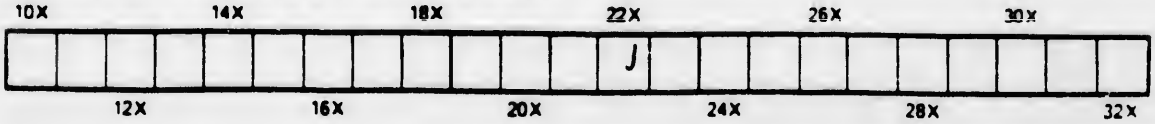

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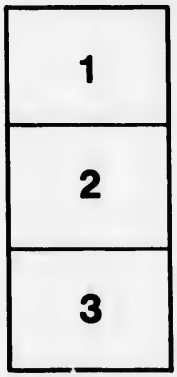

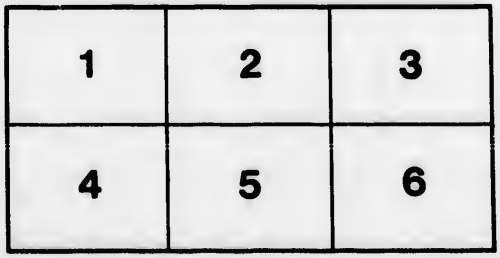

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BULLETIN (SPECIAL). TORONTO, MARCH, 1898.

ONTARIO DEPARTMENT OF AGRICULTURE.

THE SAN JOSE SCALE.

(*Aspidiotus perniciosus.*)

SAN JOSE SCALE. *a*, pear moderately infested; *b*, female scale enlarged.

This is one of the most destructive insects that has ever been found in Ontario. Fruit growers and entomologists have been much concerned during the past few years as to whether it would reach this Province, and whether, if it should come, it would be able to survive the winter season. It has come and it has survived, and in 1897 it was definitely located in several orchards in the Niagara district, and also in the southwestern district of Ontario. In three or four cases the trees infested are numbered by hundreds. The danger has come

upon us with great suddenness. It has escaped observation until it has appeared in such extent as to cause alarm. The Ontario Department of Agriculture has had extensive investigation as to the distribution of the insect, and the Minister submitted a Bill at the recent session of the Legislature which was passed and is now in force. This Act appears elsewhere in this bulletin. The hearty co-operation of all fruitgrowers is asked in the enforcement of this Act. Legislation as to this scale has been passed in most of the eastern and northern States.

When and Whence it Came.

The general consensus of opinion after much investigation is, that it came originally from California, where it was noticed as a pest in the San José Valley as far back as 1873. In 1880 Prof. Comstock described it, and named the insect *Aspidiotus perniciosus*, on account of its serious character as a scale. It is believed to have been introduced into the East in 1886-7 by two New Jersey nurseries, one at Burlington, the other at Little Silver. These firms imported from the San José Valley a variety of Japanese plum, the Kelsey, which was claimed to be curculio proof. In 1889 or 1890 the first scaly stock from this importation began to be distributed, and in August of 1893 the San José Scale was first observed on the eastern side of the Rocky Mountains. It was located in an orchard of Charlottesville, Virginia, and since then each season has extended the list of infested districts.

Why the Insect Causes Alarm.

1. It possesses marvellous powers of reproduction. A single female that has wintered over may be the progenitor of millions in a single season; some have computed that her progeny many reach the incredible number of 3,000,000,000. There may be four generations in a season, the adult females of each giving birth to living young for five or six weeks, the progeny of these bearing young when about thirty days old. Each female brings into existence 100 to 500 insects during her lifetime. Thus it will be seen that a great confusion of generations will soon exist, as there may be upon a plant at one time the young of several generations.

2. Infested young trees perish in two or three years.

3. The range of food plants is extensive, and all parts of the plant may be attacked—leaf, stem, twig and fruit. The scale has been found upon the peach, pear, plum, apple, cherry, apricot, quince, currant, gooseberry, raspberry, rose, hawthorn and even elm.

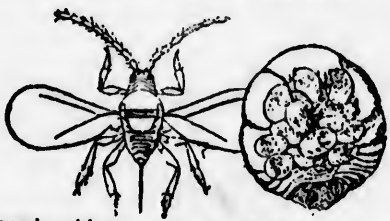
4. The insect and scale are exceedingly minute. The scale is often much the same color as the bark of the infested trees. Most are less than one-sixteenth of an inch in diameter, and are thus almost invisible to the naked eye.

5. It is readily introduced by nursery stock and fruit from infested trees.

How it may be Distributed.

In the work of distribution, the insect itself can do but little, as it is quite helpless to move from place to place. Its life of active movement is very brief—

a few hours; at most a day or two. It moves only a few inches from its birthplace, then settles, becomes covered with a scale, and in the case of the female, remains fixed for life, and begins producing young in about thirty days. After becoming fixed, it lives by sucking the sap of the plant upon which it is located. The males have wings, and may fly about at maturity, but the females are always wingless. During the few hours or days the tiny lice are moving about, they may get upon birds and such insects as ants and small beetles, and by them be carried to other trees. One observer has noticed that in infested districts the scale is often more common near a bird's nest. As trees in a nursery grow close together, they present favorable conditions for being infested. Fruit from infested trees may have the scale upon it; even wind may assist in spreading these insects that appear at first so comparatively helpless to travel by their own efforts. Thus *birds, insects, fruit, scions* from infested trees, infested *trees*, and *wind* may all be important factors in the distribution of the scale.



Female scale, with a male adult to the left, greatly enlarged.

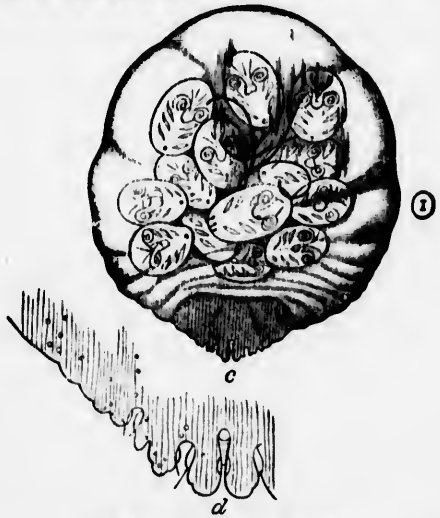
The Life History of the Insect.

The nearly fully grown insect passes the winter beneath its wax-like scale. About June the young begin to appear, as exceedingly minute, six-legged insects, like yellowish specks, moving about. They creep about only for a few hours, at most a day or two, then settle but a few inches from their birthplace, and become attached to the spot from which the females never move. During their sedentary life the females lose their feelers and legs, and have neither eyes nor wings. The males, however, have legs, feelers (antennæ) eyes and wings in the adult condition. The scale of the female is circular, with a small nipple in the centre. This scale is from a twelfth to one-twentieth of an inch in diameter, and may be of a light or dark gray color, and usually is much the same color as the bark; the nipple in the centre may be a pale yellow or blackish color. The scale of the male is oblong, with the nipple near one end, and is thus readily distinguished from that of the female. The female brings forth living young, and does not lay eggs, as is usually the case with scale insects, such as the oyster shell and scurfy scales. She may bring into life from 100 to 500 young during the six weeks of her existence after reaching the adult stage.

The males develop about a week sooner than females, the latter taking about five weeks, and emerge from their scales as exceedingly minute two-winged, fly-like insects. From June, when the young appear, a constant succession of generations is observed.

The scale of these insects is formed from a waxy secretion which commences soon after they come into existence, and forms a protective covering as development proceeds. In the earlier stages of growth the scale presents a somewhat grayish-yellow color, and gradually becomes darker.

The general appearance upon affected twigs is that of a grayish, slightly roughened scurfy deposit. This hides the natural reddish color of the young limbs of the peach, pear and apple. They sometimes even look as if sprinkled with ashes. If the scales are crushed, a yellowish oily liquid will appear from the crushed soft yellow insects beneath the scales. Examined in summer, many show orange-colored larvæ, snowy-white young scales, mingled with old brown or blackened matured scales. This insect produces a peculiar reddening effect upon the skin of the fruit and of tender twigs. An encircling band of reddish discoloration around the margin of each female scale is very marked on the fruit of pears. The cambium layer of young twigs where scales are massed is usually stained deep red or purplish. Where the scales are few the purplish ring surrounding each is quite distinguishable.



CLEAN NURSERY STOCK.

It is certain that the scale was introduced on infested nursery stock. The same danger is to be feared again. Every person who buys stock should have it thoroughly examined before setting it out. The examination should be *thorough*, as the scales are minute and are easily overlooked. There is one method of treating stock that is sure to destroy all kinds of insect life,—but it is applicable only in nurseries and not by the farmer or fruit grower—it is the treatment with hydrocyanic acid gas. Nurserymen will do well to consider the advisability of treating all stock handled by them in this way. We give the following for their benefit:

Hydrocyanic Acid Gas Treatment of Nursery Stock.

The following method is given in Bulletin 87, of the New York Experiment Station, Geneva: "This gas is lighter than air, hence will work better if the generator is placed below the pile of trees to be treated. A convenient way would be to make a rack a little less than six feet long, five feet wide, four feet high. The bottom of the rack could be made of loose slats raised a few inches above the ground to allow room to place the gas generator under the rack. When the rack is filled with trees, a piece of gas-tight canvas thrown over the whole and fastened down at the sides by throwing dirt on the margins would complete the apparatus. One side could be left open until the water and chemicals are placed in the dish and the dish slipped beneath the rack. This gas is a deadly poison, and great care should be used not to breathe it while placing the dish under the rack.

"To generate the gas pour three fluid ounces of water in a glazed earthenware vessel, to this add one fluid ounce of sulphuric acid; place under the trees, and then add one ounce by weight of fused cyanide of potassium. This will make gas enough to fill a space of 150 cubic feet." An hour's exposure will likely kill all the scale insects.

Orchard Remedies.

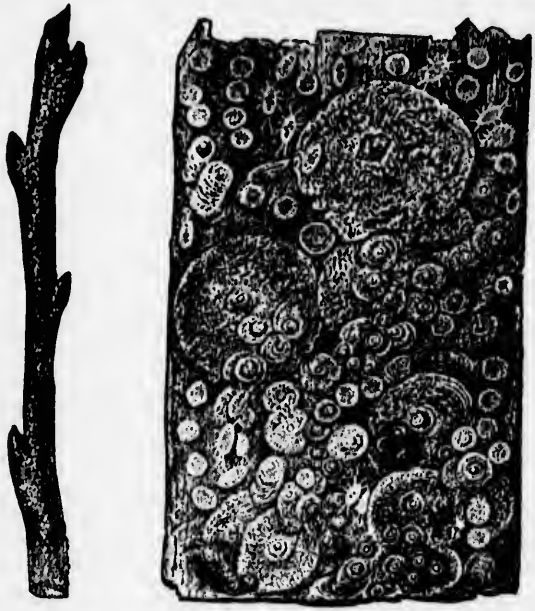
When trees are at all badly infested there is only one treatment to be recommended with safety, and that is to root up the trees and burn them at once. Even when only slightly infested the work of washing and spraying may not be done thoroughly enough to destroy every scale, and as the insect multiplies so rapidly the greatest care must be taken not to allow even one scale to remain. The advice given is to thoroughly destroy all stock and all trees found to be infested. During the winter and early spring, before the insects appear, some may desire to treat the trees before the inspector arrives to destroy under the Act. In that case the two remedies or methods of treatment are with soap wash and with kerosene.

Soap Washes. "The soap wash should be made by dissolving two pounds of fish-oil soap or so-called 'whale-oil soap' in one gallon of water. *It is absolutely necessary that a potash soap be used*, as soda soaps cannot be kept in solution at this strength, and are not so efficient as the former. The manufacturer should be required to guarantee his soap to meet the requirements as to strength and solubility. This wash should be used warm, if possible, and preferably on a warm day."

Kerosene. "If old orchard trees are infested, the probability of clearing out the pest is not at all promising. But if the trees are valuable, and have not been seriously injured, the attempt is worth while. They should first be judiciously pruned, but large wounds avoided; the trunk and branches should be cleared of rough bark, and especially the sprouts and any trash removed from around the base of the tree. Then for all orchard fruits except peach and cherry, spray with pure kerosene, *using great care to only moisten the bark.* The tree must be washed, every twig and branch, but do not put on enough oil to

run down the stem and collect about the base. If a band of any sort is placed about the tree, or if oil collects about the base of the trunk damage is almost certain to result.

"When kerosene is used it should be purchased by the barrel, and of a grade not lower than 120° flash test. Low grades are more dangerous to plants than high grades. Forty gallons of kerosene will spray three hundred to four hundred trees, depending on size, and ought not to cost over ten cents a gallon in barrel quantities. This does not make it very expensive treatment. It should always be used on a bright, warm day, when the plants are dry, and just as little applied as can be made to wet properly every part of the plant."



A. *B.*

Appearance of scale on bark; *a*, infested twig—natural size; *b*, bark as it appears under hand lens, showing scales in various stages of development and young larvæ.

Insect Enemies.

There are two enemies to the scale among insects, both of which are reported to aid very materially in keeping the scale in check. One, the "Twice-stabbed Ladybird" (*Chilocorus bivulnerus*), is very common on infested trees, apparently feeding upon the scale; the other is a chalcid parasite (*Aphelinus fuscipenius.*)

AN ACT TO PREVENT THE SPREAD OF THE SAN JOSE SCALE.

Passed January 17th, 1898.

HER MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:

1. This Act may be cited as *The San Jose Scale Act.* Short title.

2. In this Act the word "Minister" shall mean the Minister of Agriculture for the Province of Ontario. Interpretation "Minister."

The word "plant" shall mean any tree, vine, shrub or plant, or any part of a tree, vine, shrub or plant, or the fruit of any tree, vine, shrub or plant. "Plant."

The word "scale" shall mean the San Jose Scale insect in any of its stages of development. "Scale."

3. No person shall import or bring, or cause to be imported or brought into the Province of Ontario, for any purpose whatsoever, any plant infested with scale. Importation of diseased plants prohibited.

4. No person shall keep, or have, or offer for exchange or sale, any plant infested with scale. Having in possession or selling.

5. For the purpose of scientific investigation the Minister may from time to time, by writing given under his hand, except such persons as he may deem proper from the operation of the two preceding sections, and while acting under such permission, such persons shall not be subject to the penalties imposed by this Act. Scientific investigation.

6. Any person having reason to suspect that any plant in his possession, or in his charge, or keeping, is infested with the scale, shall forthwith communicate with the Minister in regard to the same, and shall furnish the Minister with all such information in regard to the source or origin of the said infestation and the extent and nature of the same as he may be able to give. Notice to Minister on discovery of disease.

7. Whenever the scale exists, or is supposed to exist on any plant, the Minister may direct a competent person to make an examination and inspection, and may order that any plant so infested, or such part as he may deem advisable, shall be immediately Investigation and report.

Destruction of diseased plant.

destroyed by burning, either by the person appointed to make the inspection, or by the person owning or having possession of the said plant, or some other person so directed in writing, and the person so directed shall make a full report to the Minister in writing as to the nature and extent of the work so performed, together with a fair estimate of the value of the plant destroyed.

Duties of inspectors appointed under Rev. Stat. c. 280.

8. For the purpose of enforcing this Act, it shall be the duty of every inspector appointed under *The Yellows and Black Knot Act* to make careful examination and inspection for the occurrence of the scale within the municipality for which he is appointed, and to report forthwith to the Minister every case of infestation, and neglect to make such report shall render the inspector liable to the penalties imposed under section 11 of this Act.

Right of access to place where tree is.

9. Any person appointed by the Minister under this Act to inspect or destroy any plant for the purpose of enforcing the provisions of the Act, shall, upon producing his authority in writing, have free access to any nursery, orchard, store, storeroom, or other place where it is known, or suspected, that any plant is kept.

Compensation for destruction of plants.

10. Upon the recommendation of the Minister, there may be paid out of the Consolidated Revenue Fund of the Province to the owner of any plant so destroyed a sum not exceeding one-fourth of the value thereof (not including fruit) as reported upon by such officer or other competent person, appointed as aforesaid, but nothing in this section shall apply to any plant imported into the Province within a period of one year prior to the examination by the officer aforesaid.

Penalty.

11. Any person neglecting to carry out the provisions of this Act, or any person offering any hindrance to the carrying out of this Act shall, upon summary conviction, be liable to a fine of not less than $20, nor more than $100, together with costs, and in default of payment thereof shall be subject to imprisonment in the common gaol for a period of not less then ten days nor more than thirty days.

Extension of Act to other scale insects.

12. The Lieutenant-Governor in Council may by order direct that other scale insects than the San Jose Scale may be included in the provisions of this Act, and thereafter during the continuance of such Order-in-Council the word "scale" in this Act shall include all such other scale insects. Public notice of such Order in-Council shall be given by publication in two successive issues of *The Ontario Gazette*.