SOIL, WATER AND CROP FACTORS THAT INDICATE MOSQUITO PRODUCTION

STERLING DAVIS [1]

INTRODUCTION

The reduction of mosquito populations by eliminating breeding sites on irrigated fields becomes more important every day. There are two ways to eliminate mosquito producing waters, (1) drain them off, and (2) apply only the amount of water the soil will take. The best method for crop production is the second, which is probably best also for mosquito reduction, as it fosters better crop production and better management.

This paper describes a method of evaluating the mosquito-producing potential of a field or area. The same system will point to factors leading to mosquito production and examples of changes to be made.

The SOIL FACTORS considered (A) are *slope, permeability* ("intake rate") and *topography*. The WATER FACTORS (B) are *surface water applied, ground water depth* and *irrigation method*. Other items considered are crops grown and the management of these factors.

Slope.—The slope of a field has much to do with the potential mosquito production. Slopes in excess of 0.5 percent (i.e., one-half foot fall in each 100 feet) generally will not be considered as serious mosquito producers. The slope groups are divided into seven units and rated 1 to 7.

Intake Rate.—The way in which the soil takes water is very important in determining the mosquito production potential. Soils that have intake rates of near 0.1 inch per hour and less can be problem soils. The intake rates are also rated 1 to 7.

[1] Irrigation Engineer, U. S. Department of Agriculture, Agricultural Research Service, Soil and Water Conservation Research Division, Western Soil and Water Management Research Branch, Grand Junction, Colorado.

A. SOIL FACTORS (Table 1)

TABLE 1.—Rating and description of factors involved in mosquito production potential

A. SOIL FACTORS

Slope

Rating	Description	Ft./100
1	Very flat	0 –0.1
2	Flat	0.1 –0.25
3	Moderately flat	0.25–0.75
4	Moderate	0.75–1.50
5	Moderately steep	1.50–2.50
6	Steep	2.50–5.00
7	Very steep	Above 5.00

Intake rate

Rating	Description	In/hr.
1	Very slow	0.0 –0.05
2	Slow	0.05–0.1
3	Moderately slow	0.1 –0.25
4	Moderate	0.25–0.50
5	Good	0.5 –1.0
6	Fast	1.0 –2.0
7	Very fast	Above 2.0

Topography

Rating	Description
1	Deep, numerous undulations
2	Moderate, numerous undulations
3	Deep, few undulations
4	Moderate, few undulations
5	Slight, numerous undulations
6	Slight, few undulations
7	No undulations, well prepared for irrigation

Topography.—This factor is the smoothness or unevenness of the field. The rating is from 1 to 7 depending on the depth and number of undulations. As these undulations get deeper and more numerous the mosquito potential is greater.

Surface Water Used.—When the water right or available water for use is high, then more water is used. When the consumptive use of the plant is exceeded the

B. WATER FACTORS (Table 2)

TABLE 2.—Rating and description of factors involved in mosquito production potential

B. WATER FACTORS

Surface water used

Rating	Description
1	Abundant—More than 10 ac. ft./ac./year
2	Excess—5 to 10 ac. ft./ac./year
4	Consumptive Use (plus) 2.5 to 5 ac. ft./ac./year
7	Consumptive Use (minus) 2.5 ac. ft./acre/year or less

Ground water

Rating	Description
1	Shallow—Less than 18"
2	Moderate—18 to 30"
3	Good—30 to 60"
4	Excellent—More than 60"

Irrigation method

Rating	
1	Ponding
2	Wild flooding
3	Border ditch
4	Contour ditch
5	Border
6	Furrow
7	Sprinkler

excess water (above plant needs) is left to pond or cause trouble in other ways. The surface water is rated 1, 2, 4 and 7, depending upon the amount available.

Ground Water.—Ground water can cause serious trouble if it is high and does not allow excess water to get away. Ground water is rated 1 through 4, depending on depth to water.

Irrigation Method.—While the operation of a given irrigation method is very important there are certain physical factors in each method that favor mosquito production. The methods are rated 1 to 7.

C. CROP FACTORS (Table 3)

TABLE 3.—Crop Factors

Rating	
1	Native grass (hay or pasture), water plants
2	Pasture and grasses
5	Alfalfa
6	Small grains
7	Row crops

Crops are rated 1, 2, 5, 6, 7. Some crops will allow standing water while others will not. Crops not listed could be added with crops having the same response to standing water.

D. MANAGEMENT FACTORS (Table 4)

TABLE 4.—Management Factors

Rating	
1	Very poor
2	Poor
3	Fair
4	Good to fair
5	Good
6	Very good
7	Excellent

This factor is rated 1 to 7. A main concern of this factor will be the care given to irrigation water. The interest and experience of the operator will have to be considered.

TABLE 5.—Mosquito production potential rating table

Soil			Water						
Slope	Intake rate	Topography	Surface used	Ground	Irrigation method	Crop	Management	Ave.	Mosquito Potential
1	1	1	1	1	1	1	1	1.5	Extremely high
2	2	2	2	2	2	2	2	2.0	High
3	3	3	3	3	3	3	3	2.5	Moderate
4	4	4	4	4	4	4	4	3.0	Slight
5	5	5	5	5	5	5	5	3.5	None
6	6	6	6	6	6	6	6		
7	7	7	7	7	7	7	7		

RATING THE MOSQUITO PRODUCTION POTENTIAL

Rating is done conveniently with the aid of a table (Table 5). The purpose of the rating table is two-fold. First, potential mosquito production of an area can be estimated, and second, and more important, the table points to the trouble-causing factors and assists in analysis of each problem. The lower the rating the greater the possibility of mosquito production.

Presented below are some examples of actual fields where mosquito counts have been made and irrigation water measured, pointing out their trouble-causing factors and possible solutions.

EXAMPLE 1.

California pasture field, low intake, flat slope, contour dikes (ponding), much water used and no ground water. The factors would add up like this:

Factor	Rating
Slope	1
Intake rate	2
Topography	2
Water used	1
Ground water	4
Irrigation method	1
Crop	2
Management	2
Total	15
Average	2

Rating—High mosquito production

ANALYSIS: *Slope*—Nothing much can be done; *Intake rate*—No change; *Topography*—Level, change rating from 2 to 6, *Water used*—Consult irrigation guide, change rating from 1 to 4; *Ground water*—Leave the same; *Irrigation method*—Install borders, change rating from 1 to 5; Crop—Leave the same; Management—More care, change rating from 2 to 6. *Now add up:* 1, 2, 6, 4, 4, 5, 2, 6; total, 30. Average, 3 5/8: No mosquitoes.

Changes: Level the land, change irrigation system and amount of water used, and take more care in management. *Result*—No mosquitoes, better production, more valuable land.

EXAMPLE 2.

Bluejoint meadow, Montana, flat, low intake rate, much water.

Factor	Rating
Slope	1
Intake rate	1
Topography	1
Water applied	1
Ground water	2
Irrigation method	1
Crop	1
Management	1
Total	9
Average	1.2 = Extremely high mosquito production

ANALYSIS AND CHANGES. *Slope*—No change; *Intake rate*—No change; *Topography*—Level, change from 1 to 7; *Water applied*—Apply as per guide, change from 1 to 4; *Ground water*—With less water applied this will probably change from 2 to 4; *Irrigation method*—Border, change from 1 to 5; *Crop*—Change to alfalfa, 1 to 5; *Management*—More care, change from 1 to 5; *Now add up:* 1, 1, 7, 4, 4, 5, 5, 5; total, 32. Average, 4: No mosquitoes.

Production change from one-half ton bluejoint hay per acre to 5 tons per acre of alfalfa.

EXAMPLE 3

California cotton field, flat, high intake rate, water pumped, no ground water.

Factor	Rating
Slope	1
Intake rate	5
Topography	6
Water used	4
Ground water	4
Irrigation method	6
Crop	7
Management	5
Total	38
Average	4+ = No mosquitoes

EXAMPLE 4

Alfalfa field, Montana, borders, flat, no water-table.

Factor	Rating
Slope	1
Intake rate	1
Topography	7
Water used	4
Ground water	4
Irrigation water	5
Crop	5
Mangement	6
Total	33
Average	4+ = No mosquitoes

SUMMARY

A combination of factors is required to produce mosquitoes; the rating table points out the problem factors. Use of information from irrigation guides, land leveling, and attention to all items involved can reduce mosquito-breeding sites.

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