SEPTIC SYSTEMS
AND
LAKE WATER QUALITY

MWSC CONFERENCE
MARCH 30, 2023

PRIMARY PURPOSE IS THE PROTECTION OF HUMAN HEALTH FROM PATHOGENS IN WASTEWATER

PEOPLE GET SICK AND DIE FOR PATHOGENS IN WASTEWATER

THAT IS WHY THE STATE SEPTIC SYSTEM PROGRM IS LOCATED WITHIN

HEALTH AND HUMAN SERVICES –CDC

NOT THE DEPARTMENT OF ENVIRONMENTAL PROTECTION

MAINE DESERVES CREDIT FOR BEING PROGRESSIVE WITH SEPTIC SYSTEM REGULATION (LINED SYSTEMS) BUT NUTRIENT ATTENUATION HAS NOT BEEN A FOCUS

SEPTIC SYSTEMS WERE ORIGINALLY DESIGNED FOR USE IN RURAL AREAS ON A TEMPORARY BASIS – UNTIL SEWER SYSTEMS REPLACED THEM

MOST RURAL AREA SEPTIC SYSTEMS USED AN OUTHOUSE AND ONLY SMALL AMOUNTS OF GRAY WATER WENT SUBSURFACE

LIMITED IMPACT IN SLZ DUE TO SEASONAL USE AND LOW VOLUME OF WATER

NO LAUNDRIES OR SHOWERS

TODAY
SEASONAL CAMPS HAVE:

PRESSURIZED WATER
ARE USED YEAR ROUND
BIGGER
MANY MORE OF THEM

MANY LAKE SHORELAND ZONED AREAS NOW HAVE HUNDREDS OF THOUSANDS OF GALLONS OF WASTE WATER MOVING TOWARD LAKES

COMPARED TO JUST A FEW GALLONS SEASONALLY

WATER IS THE MECHANISM BY WHICH NUTRIENTS IN WASTEWATER MOVE TOWARD AND INTO LAKES AND OTHER WATERBODIES

IN LAKE WATERSHEDS PHOSPHOROUS IS THE LIMITING NUTRIENT FOR ALGAL BLOOMS

N CAN BE SUPPLIED BY N FIXING BACTERIA

DOMESTIC WASTEWATER CONTAINS ABOUT 10 MG/L OF PHOS.

270 GPD/3 BEDROOM HOME PRODUCES ABOUT 8 LBS. OF PHOS. PER YEAR

LONG TERM ALGAL BLOOMS IN LAKES ONLY TAKE FROM 0.05 – 0.5 MG/L

WHILE ALL SEPTIC SYSTEMS ARE LIKELY TO EVENTUALLY CONTRIBUTE NUTRIENTS TO A WATERBODY

SOME ARE MUCH MORE LIKELY AND CONTRIBUTE MUCH MORE THAN OTHERS

PHOSPHOROUS IS TIED UP IN THE SOIL BY

ADSORPTION TO CLAY, IRON AND ALUNIMIN OXIDES

IRON AND ALUMINUM PHOSPHATE MINERALS

TAKEN UP BY PLANTS

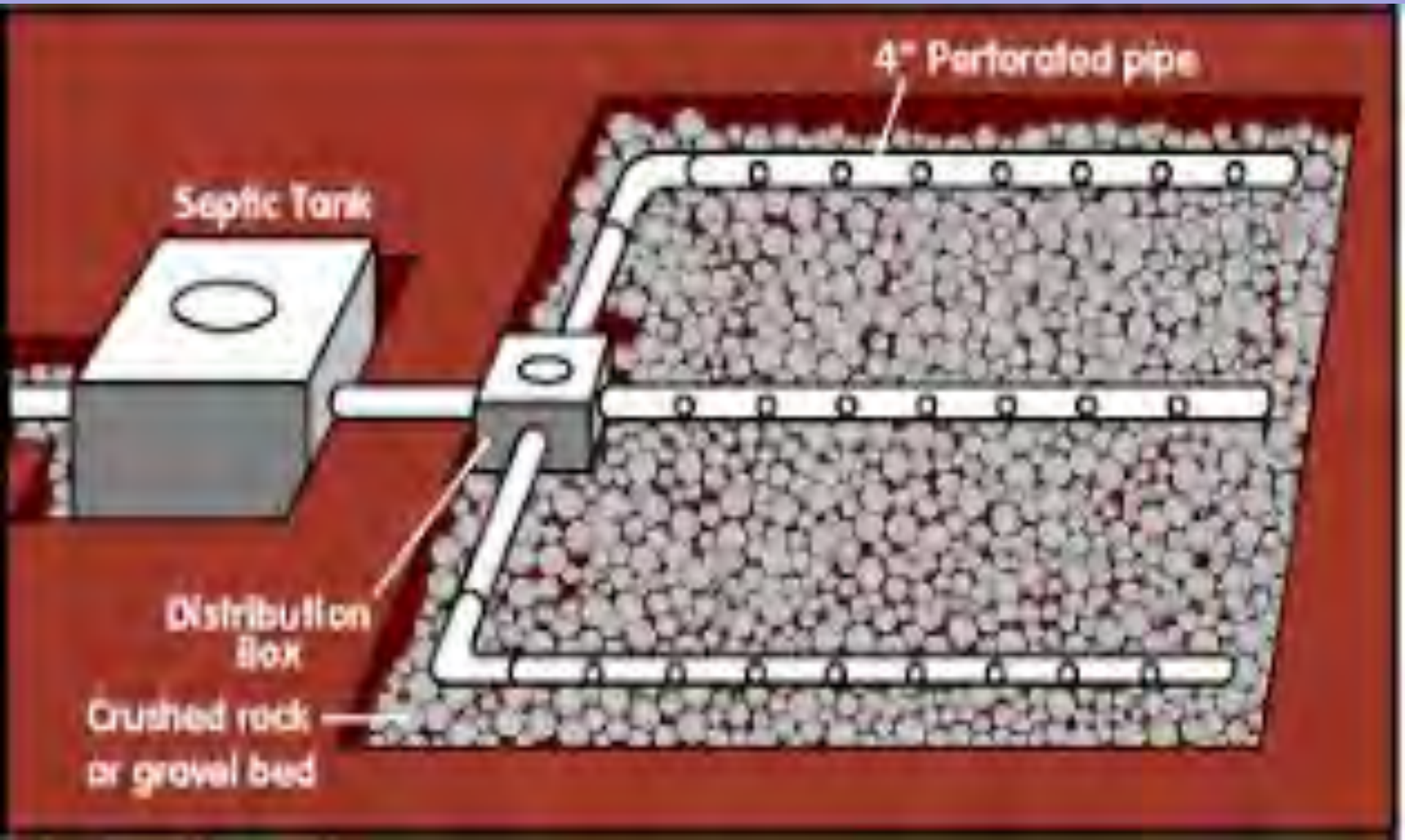
SOILS WITH THE GREATEST ABILITY TO TIE UP PHOSPHOROUS

FINE TEXTURED SOILS WITH CAPILLARY PORES & A RESTRICTIVE LAYER

RETAINING P IN MOST BIOLOGIALLY ACTIVE SOIL LAYERS

WHAT IS AN ON-SITE SEPTIC SYSTEM AND HOW DO THEY WORK

TYPICAL SEPTIC SYSTEM



DISPOSAL FIELD WASTEWATER TREATMENT IS PROVIDED BY:

BIO-MAT
SOIL (CEC)
OXYGEN
MICROBES
PLANT ROOTS

DISPOSAL FIELD BIO-MAT

BIO-MAT WILL NOT FORM UNDER:

SOME PROPRIETARY DEVICE SYSTEMS
ADVANCED TREATMENT UNIT SYSTEMS
LIGHTLY USED SEASONAL CAMPS

SEPTIC SYSTEM SUITABILITY AND DESIGN

BASED ON PERC TEST UNTIL JULY 1, 1974 WHEN SITE EVALUATION WAS ADOPTED

CONVENTIONAL THINKING WAS (AND IN SOME CASES STILL IS):

THE FASTER THE WATER INFILTRATED INTO THE GROUND THE BETTER

FOCUS WAS TO GET PATHOGENS SUBSURFACE UNTIL THEY DIED OFF

10 – 30 DAYS FOR BACTERIA
50 - 120 DAYS FOR VIRUSES

PROPRIETARY DEVICES BEING USED INSTEAD OF STONE BEDS DUE TO SMALLER FOOT PRINT

RELATIVELY INEXPENSIVE

50% TO 75% SMALLER

LESS FILL NEEDED

LESS SOIL PORE CLOGGING DUE TO FABRIC TREATMENT AREA

EMERGING TECHNOLOGIES FOR ON-SITE SYSTEMS

ADVANCED TREATMENT UNITS (ATU'S)

MOST ARE SMALL PACKAGE TREATMENT PLANTS IN A TANK

A FEW JUST ADD AIR TO THE SEPTIC TANK OR EFFLUENT IN DISPOSAL FIELD

PACKAGED TREATMENT PLANT

PRIMARY FUNCTION

REDUCE BOD5 AND TSS

PATHENOGENIC BACTERIA

REDUCE FOOTPRINT SIZE

CAN REDUCE NITROGEN

TECHNOLOGY MOVING TOWARD NUTRIENT REDUCTION DUE TO CONTAMINATED WATERBODIES IN SEVERAL STATES

CONSEQUENCES OF NUTRIENT OVERLOAD IN LAKE

NUTRIENT OVERLOAD CAN CAUSE FISH KILLS

MANY UNITS CAN REDUCE NITROGEN LEVELS

VERY FEW APPROVED MODELS REDUCE PHOSPHOROUS (TERTIARY UNITS)

ONE ATU MANUFACTURER HAS A UNIT BEING USED IN EUROPE THAT DOES REMOVE PHOSPHORUS

20 EXPERIMENTAL SYSTEMS INSTALLED IN U.S.

SEPTIC SYSTEM FAILURES SIGNIFICANT CONTRIBUTOR TO WATER QUALITY IMPAIRMENT

BOTH PATHOGENS AND NUTRIENTS

TWO MOST COMMON CATEGORIES OF SEPTIC SYSTEM FAILURES

PLUGGED/CRUSHED PIPE
HYDRAULIC FAILURE

STRAIGHT PIPES ARE NOT FAILURES BECAUSE THEY ARE NOT SYSTEMS

HYDRAULIC FAILURE

THE MOST COMMON CAUSE FOR SEPTIC SYSTEM FAILURES

HYDRAULIC FAILURES

EFFLUENT IS UNABLE TO INFILTRATE INTO THE GROUND DUE TO SOIL CLOGGING, GROUNDWATER TABLE, TOO MUCH WATER USAGE, POOR FILL MATERIAL, ETC.

MOST SEPTIC SYSTEM HYDRAULIC FAILURES TODAY ARE DUE TO LACK OF HOMEOWNER MAINTENANCE OR HOMEOWNER ABUSE

DRAINFIELD BIO-MAT
A TWO EDGED SWORD

PROVIDES SIGNIFICANT REDUCTION OF PATHOGENS BUT PRINCIPLE CAUSE OF HYDRAULIC FAILURES IF TOO THICK

EXCESSIVE BIO-MAT FORMATION

SHORT CIRCUITS

JUST BEGINNING TO SHOW UP ON THE RADAR SCREEN AS A SEPTIC SYSTEM PERFORMANCE PROBLEM

SHORT CIRCUIT
(NOT AN OFFICIAL TERM)

EFFLUENT PASSES QUICKLY THROUGH VERY COARSE SOIL OR BEDROCK FRACTURES

SOLUTION TO POLLUTION IS DILUTION

PATHOGEN REDUCTION MAY OCCUR IF IT TAKES LONG ENOUGH FOR EFFLUENT TO REACH WATERBODY

BUT VERY LITTLE NUTRIENT REDUCTION

SSWWD RULES FOR SEPTIC SYSTEM INSPECTIONS DO NOT INCLUDE LOOKING FOR A SHORT CIRCUIT

THREE PRIMARY CONDITIONS WHERE SHORT CIRCUITS OCCUR

FRACTURED BEDROCK
COARSE TEXTURED SOIL
COARSE TEXTURED FILL

FRACTURED BEDROCK

TOPSHAM WELL CONTAMINATION INVESTIGATION

SAND AND GRAVEL OUTWASH SOILS

INSTALLING SYSTEMS ON OR IN THE TOPSOIL LAYER IS THE MOST EFFECTIVE WAY TO PREVENT SHORT CIRCUITS IN COARSE TEXTURED SOILS

CAPILLARY PORES

(LITHOLOGIC DISCONTINUITY)

MOST BIOLOGICALLY ACTIVE LAYER

PLANT ROOTS

WELL CONTAMINATION DUE TO FORT FAIRFIELD POTATOES

DRAINAGE DITCH BESIDE DISPOSAL FIELD

VERY COARSE TEXTURED FILL MATERIAL CAN EXTEND TO FRACTURED BEDROCK OR TO DRAINAGE SWALES AND OTHER CONCENTRATED FLOW CHANNELS

WHICH SEPTIC SYSTEMS IN MAINE ARE THE MOST LIKELY TO BE A SHORT CIRCUIT?

CONCERN RATING SCALE:

PRE-1974 SYSTEMS

PRE-1995 SYSTEMS IN SANDY OR SHALLOW SOILS

ATU SYSTEMS IN SANDY OR SHALLOW SOILS

PRE-1974 SYSTEMS

IF USED TO ANY EXTENT, SHOULD HAVE FAILED BY NOW

MOST STILL IN USE ARE IN SANDY OR SHALLOW SOILS

PRE-1995 SYSTEMS

SSWWD RULES ADOPTED IN 1995 REQUIRED A LINER IN SYSTEMS INSTALLED IN SANDY SOILS IN THE SHORELAND ZONE

2015 OUTSIDE SLZ

ACTIONS LAKE ASSOCIATIONS CAN TAKE TO IDENTIFY POSSIBLE SHORT CIRCUITS:

USE WEB SOIL SURVEY TO IDENTIFY SOILS MOST LIKELY TO HAVE SHORT CIRCUITS

THEN DO ON-SITE INVESTIGATIONS

SSWWD RULES INVESTIGATIONS NOT REQUIRED

LIMITED INVESTIGATIONS WITH AUGER BORINGS FIRST STEP

BIO-MAT EVALUATION ONLY WERE NECESSARY

REPLACE PRE-1974 SEPTIC SYSTEMS

*ENCOURAGE DISPOSAL FIELD INSTALLATIONS IN OR ON THE TOPSOIL LAYER OF SANDY/GRAVELLY SOILS

HIGHEST CEC AND MOST BIOLOGICALLY ACTIVE

*DO NOT REMOVE TOPSOIL FROM SHALLOW TO BEDROCK SOILS AND REPLACE IT WITH CLEAN GRAVEL

FINE TEXTURED FILL CAN'T BE USED DUE TO DESTRUCTION OF NATURAL POROSITY

NATURAL SOIL CAN BE USED IN PLACE BECAUSE IT RETAINS ITS STRUCTURE AND POROSITY

AVOID SEPTIC SYSTEM FILL EXTENSIONS FROM CONNECTING WITH A WATERWAY

CUT VEGETATION/RAKE LEAVES OVER DISPOSAL FIELD AND FILL EXTENSIONS AND DISPOSE OF IT ELSEWHERE TO REMOVE NUTRIENTS FROM ATTENUATION AREA

DEVELOP PRIORITY LIST FOR REPLACEING SYSTEMS

VOLUME OF WATER USED
SEASONAL VS YEAR ROUND
DEGREE OF THREAT

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