

Model Decentralized Wastewater Practitioner Curriculum

SOILS 230 Restrictive Horizons

Suggested Course Materials

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Suggested Course Materials

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Agenda

Time	Topic	Speaker
845-900	Introduction Welcome Objectives	
900-915	Review of local rules	
915-930	Types of restrictive horizons (list of types) Fragipan Ortstein (organic, iron, aluminum) Claypan Petrocalcic Petrogypsic Duripan Cd Horizons (dense till) Iron pan (petroferric) Plinthite (Paleosols and stone lines – local) Anthropogenic Pans (plow pans, compacted, traffic pans, feed lot pans, “hardpans”)	
930-1030	Formation – secondary accumulation of materials Fragipan – Si, Al, clay, Fe, self weight collapse (dewatering) Ortstein – Al, Fe, organics Claypan - clay Petrocalcic - calcium carbonate Petrogypsic - gypsum Duripan – Si Add others from above	
1030-1045	Break	
1045-1200	General locations/environments in which restrictive horizons form (ALL) Fragipan – cool, humid Ortstein – cool, humid Claypan - humid Petrocalcic - arid Petrogypsic - arid	

Duripan – arid

Add others from above

Characteristics/morphology/field identification of restrictive horizons (SPECIFIC TO LOCATION)

Roots can penetrate restrictive only along vertical fractures

1200-1245

Lunch

1245-130

Locations and Characteristics (cont.)

130-200

Impact of restrictive horizon on onsite wastewater treatment and land use

Reduced porosity

Decreased permeability and aeration

Removal of nutrients (P)

Perching water (hydrologic implications)

Increased lateral flow

Erosion influence, compaction

Increased construction costs (total cost)

Increased management inputs

Decreased root penetration

200-230

Impact of effluent on restrictive horizons

Dissolve petrocalcic, petrogypsic, duripan or not

Dispersion of clay (role of Na)

230-300

Disruption, reformation, and management of restrictive Horizon after deep tillage

Ortstein – 10 days with blueberry extract

Fragipan – Fritton et al in PA, Rhoton in MS with fly ash

Claypan – USDA-ARS

Traffic pans – subsoiling

Terralift or other disruptive

Removal of offending material

300-315

Break

315-500

Field examination of restrictive horizons

(Not all restrictive horizons are observable in a single state)

Field test for ID

Morphology
Penetration resistance
Slaking
Rupture resistance (finger squeeze)
Consistence
Structural examination
Perching of water (redoximorphic features etc.)

Management
Tillage examples (subsoiling)
Disruption methods (Terralift)
Removal of material – illustrate reformation?
Perching of water (how to deal with it)

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Overview

This short course covers the range of restrictive horizons that interfere with downward water flow in soils and inhibit site suitability for most types of on-site systems. These types of soil horizons can include: fragipans, densipans, claypans, caliche, petrocalcic horizons, petrogypsic horizons, petroferric horizons, ortstein, duripans, laterites, plinthite and anthropogenic pans such as tillage pans, plow pans and hard pans. Characteristics of restrictive horizons vary according to region of the country, therefore, this one to two-day short course will focus in the field on those restrictive horizons that are common in the locale of the short course. However, other restrictive horizons will be covered in less detail. The physical and chemical features of these pans will be addressed as well as use and management implications.

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Goals

1. Participants will master an advanced working knowledge of the restrictive horizons used for accurate field descriptions. .
2. Participants will begin learning how to apply their knowledge of restrictive horizons to a typical land use question – land suitability for an on-site wastewater treatment system.

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Learning Objectives

1. Gain a better understanding of how to define restrictive horizons.
2. Gain a better understanding of how restrictive horizons form.
3. Gain a better understanding of how to evaluate restrictive horizons.
4. Gain a better understanding of how restrictive horizons affect wastewater treatment and dispersal.

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Prerequisites

SOILS 110

Soils 230 Evaluation Form

Restrictive Horizons

Evaluation Form

Name (optional): _____

With a rating scale of 1 (Disagree) to 5 (Agree), please respond to the following questions

Review of printed materials:

	Disagree				Agree
The text completely covers the topic area.	1	2	3	4	5
The visuals completely cover the topic area.	1	2	3	4	5
The discussion notes completely cover the topic area.	1	2	3	4	5

Review of learning objectives:

I gained a better understanding of how to define restrictive horizons.	1	2	3	4	5
I gained a better understanding of how restrictive horizons form.	1	2	3	4	5
I gained a better understanding of how to evaluate restrictive horizons.	1	2	3	4	5
I gained a better understanding of how restrictive horizons affect wastewater treatment and dispersal.	1	2	3	4	5

What specific recommendations would you provide for the text.

What specific recommendations would you provide for the visuals.

What specific recommendations would you provide for the notes

Please give specific positive comments on the topic/module

Soils 230 Problem Sets

None

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Additional Materials

Munsell Color Books

Augers

Tape Measures

County Soil Survey

Soil Monoliths or Cores

Soil Pits

Hand samples of restrictive horizon material