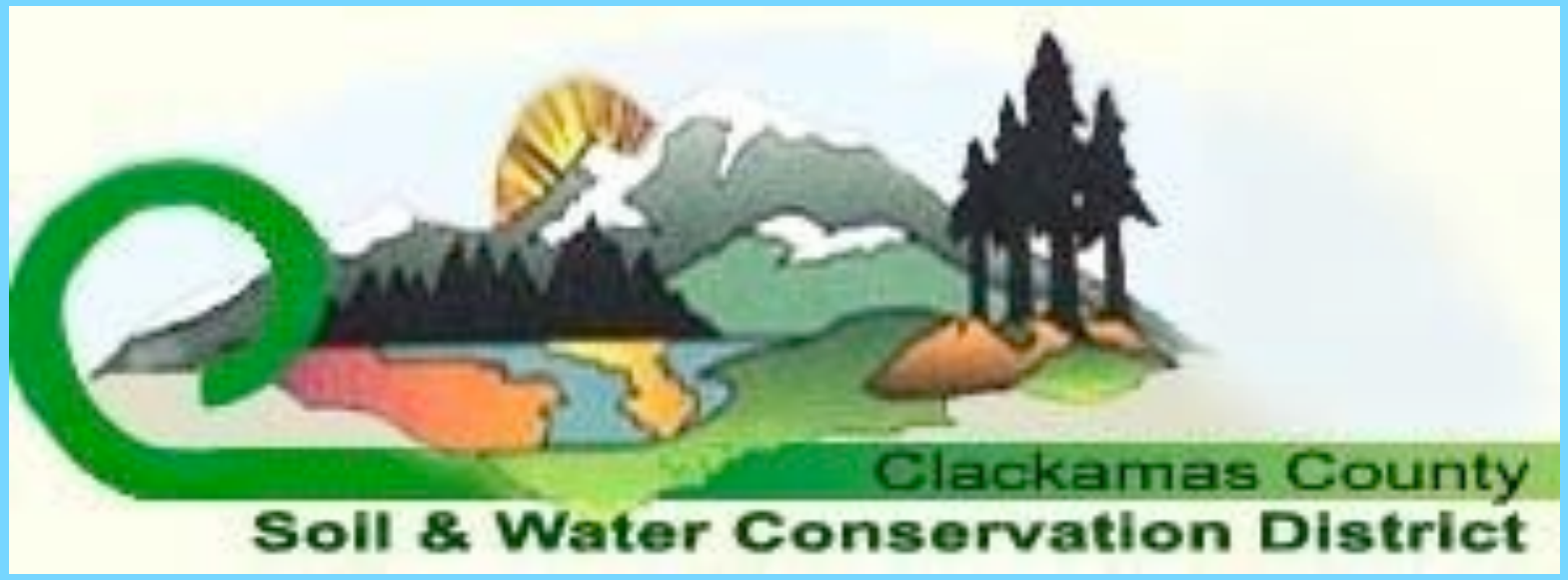


CCC logo here

Basic Ponds

Planting, Design, Construction and Maintenance

Rick Gruen & Clair Klock

Agricultural Handbook 500

Pros and Cons of building a Farm Pond

Water Needs

Fire Protection

Livestock

Fish production

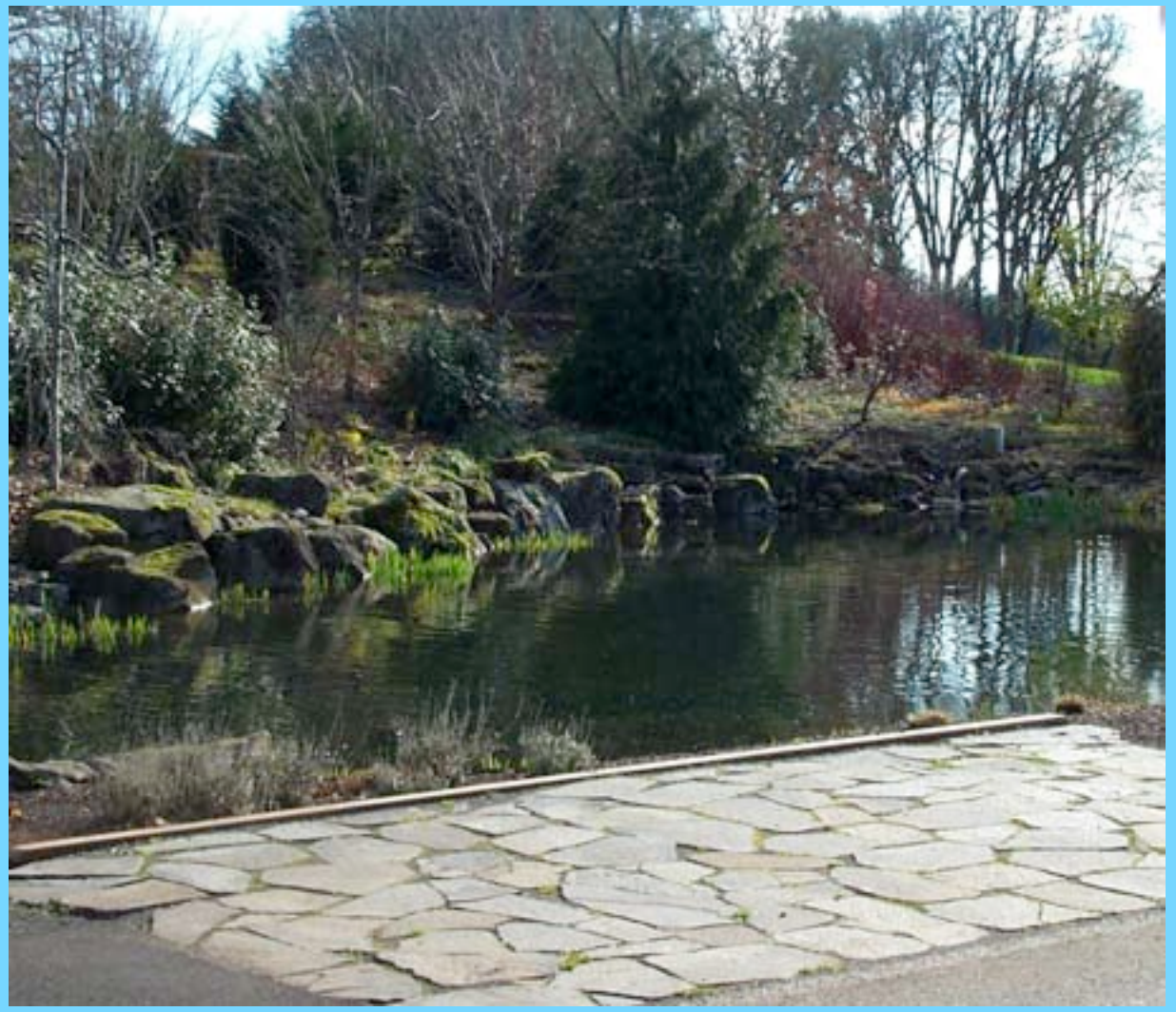
Irrigation – including spray water

Water Needs

Water Needs

Recreation

Landscaping



Water Needs

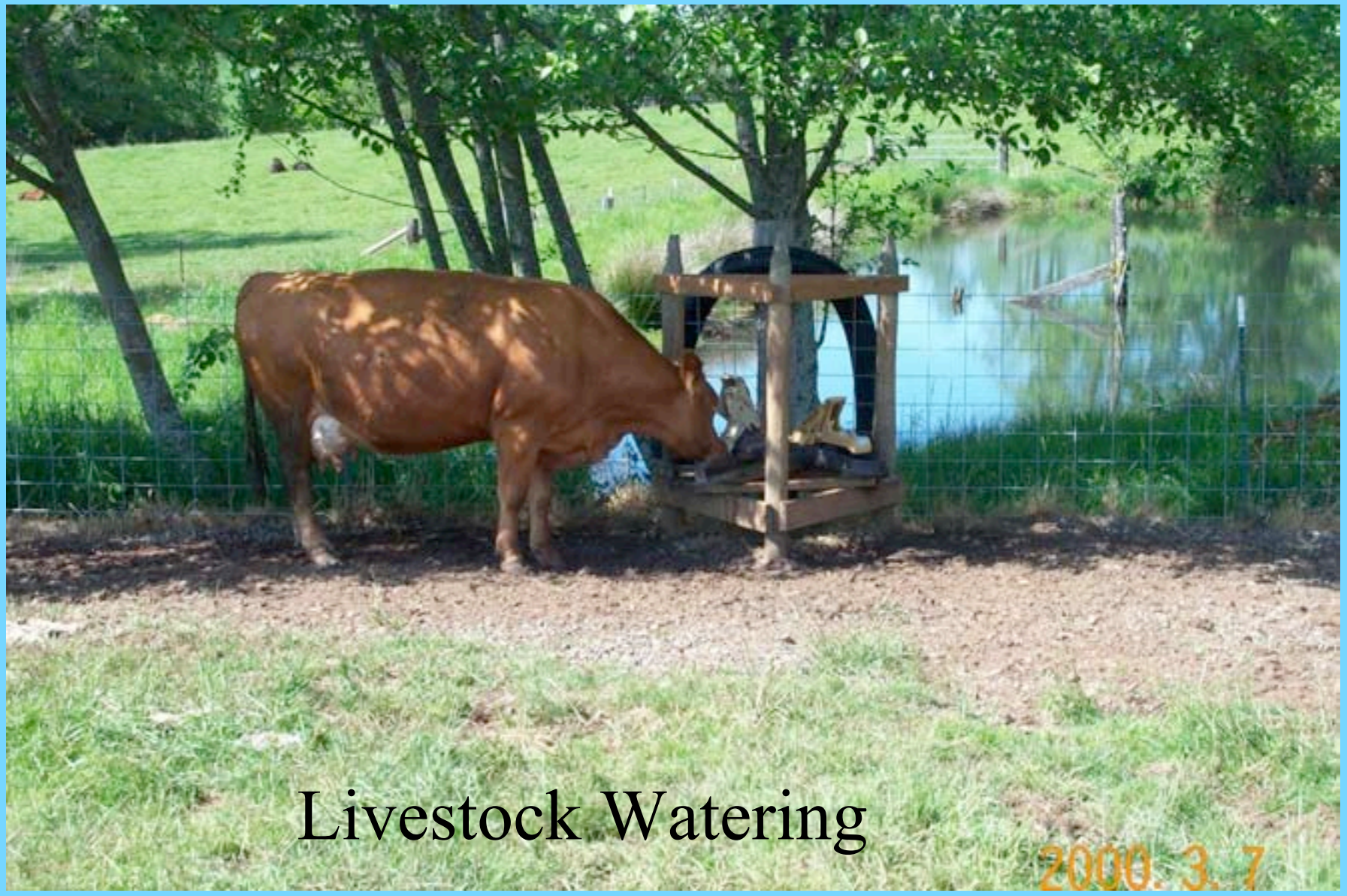
Wildlife

?? species

Depth & shallows

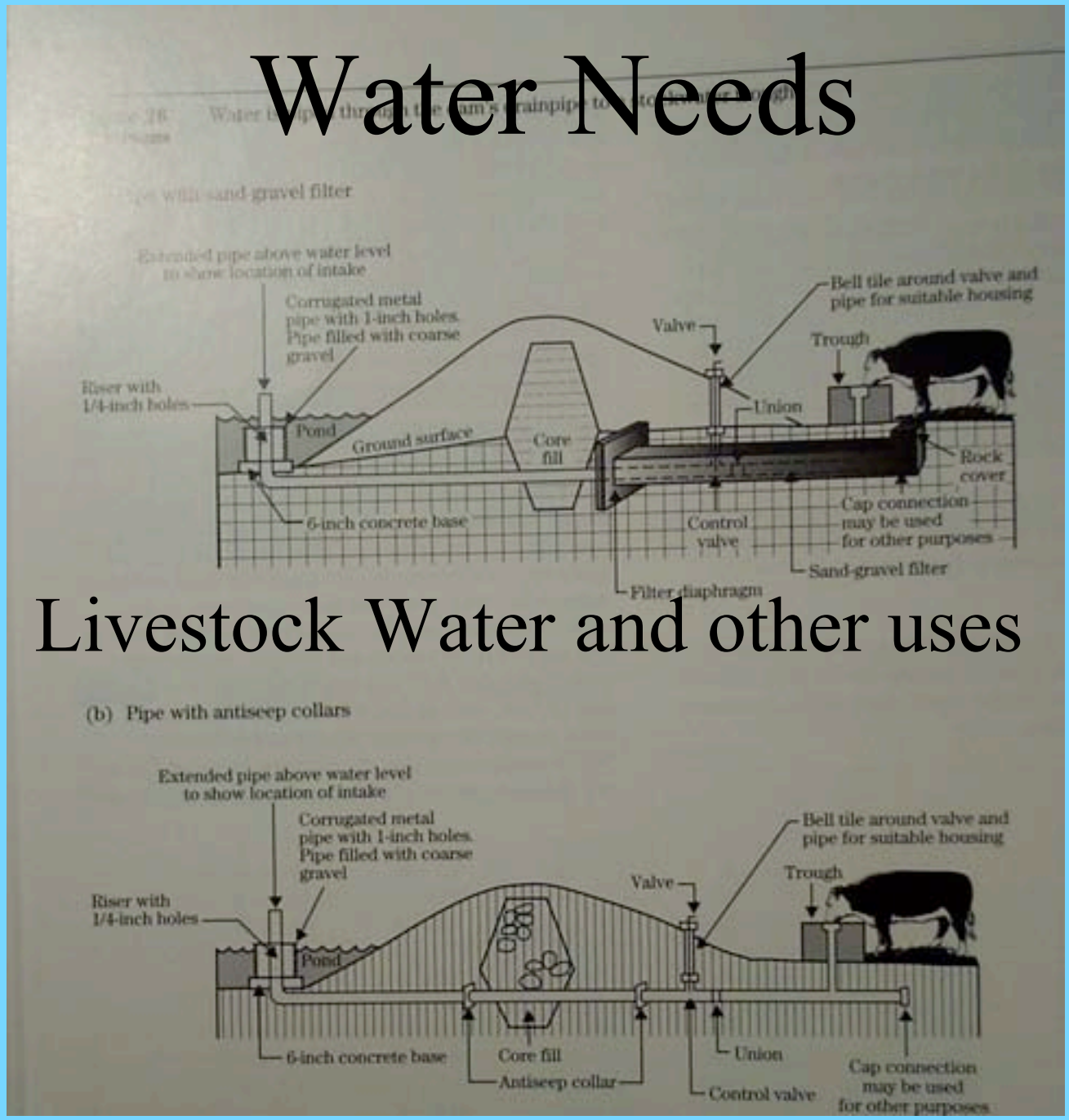
Surrounding vegetation

Water Needs



Livestock Watering

Water Needs



Livestock Water and other uses

Water Needs

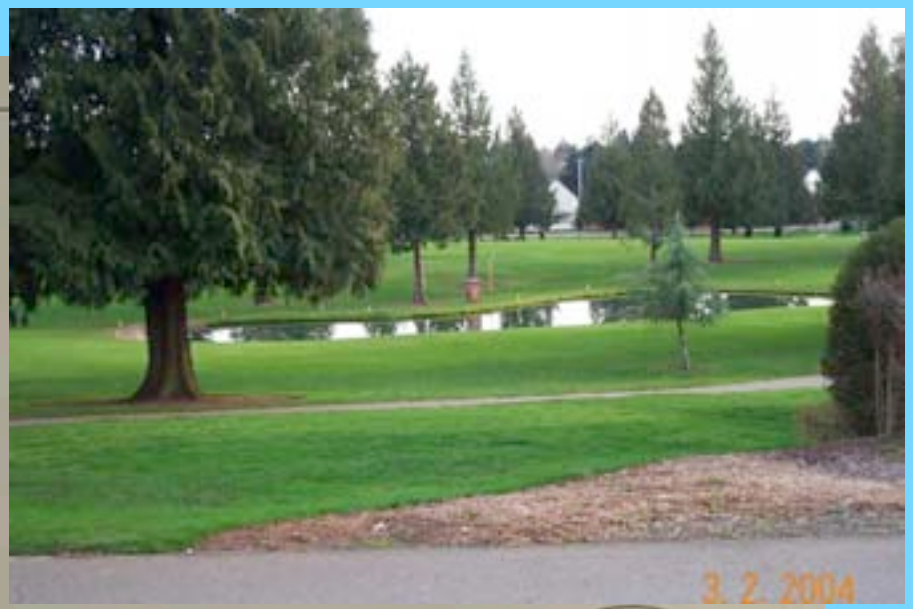


Figure 6 Details of a dry hydrant installation

Fire Protection

Water Needs

Municipal Wetland Sewage Systems

Water Rights

All surface and groundwater belong to the state with exceptions

Application Cost

Water Rights

and

Water Harvesting

Water Rights

Water Rights

Watermaster – Oregon State Water Resources Department

Mike McCord – ***District 20***
1678 S. Beavercreek Rd Suite "L"
Oregon City, Oregon 97045
Ph: 503-722-1410 *Fax: 503-722-5926*

http://www.wrd.state.or.us/waterrights/wris.shtml

Permitting

50 cu yards or more

Any amount in essential salmon habitat

Any amount of material in a scenic waterway

Permitting

Oregon Division of State Lands

Steve Morrow

Permits and Compliance

503.378.3805 x 297
www.oregonstatelands.us

List of permitting consultants
http://statelands.dsl.state.or.us/wetlands_consultants.pdf

Permitting

County

River and Stream Conservation Area Ordinance (Section 704)

www.co.clackamas.or.us/dtd/zoning/zdo

US Army Corps of Engineers

www.nwp.usace.army.mil/op/g/notices/Slopes.pdf

Permitting

Oregon Department of Fish and Wildlife (ODFW)

Off-Channel vs. Inchannel

Salmonid bearing streams

Liability

Attractive Nuisance

Fencing

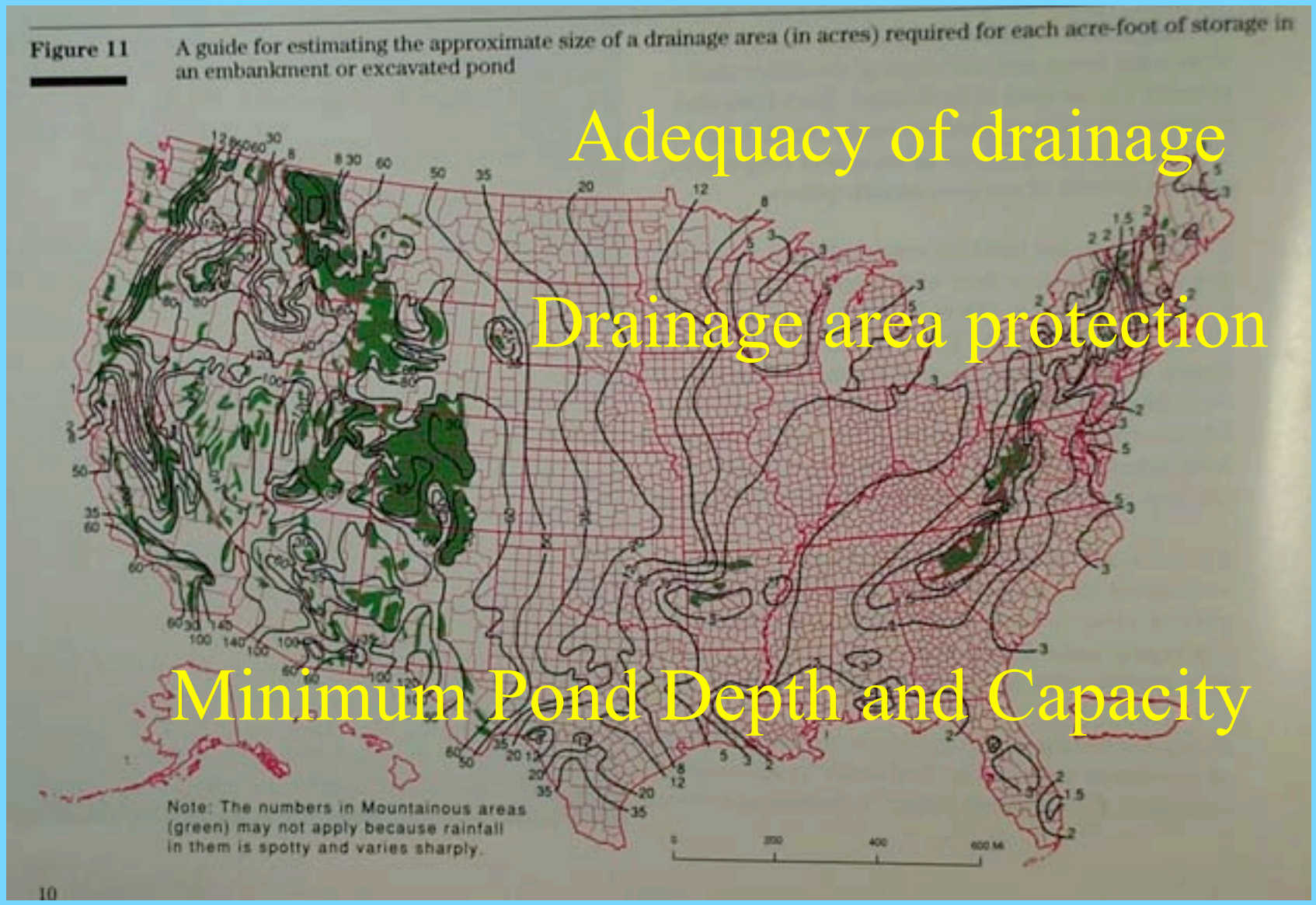
Young children

Livestock and Bacteria

Septic systems and bacteria

Are you open to the public?

Think About



Adequacy of drainage

Drainage area protection

Minimum Pond Depth and Capacity

Estimating Storm Runoff

Hydrologic Soil Groups

A – High Infiltration - sandy

B – Moderate – fine to coarse texture

C – Slow – fine to very fine texture - plowpans

D – Very Slow - chiefly clay – claypans and impervious layer

Estimating Storm Runoff

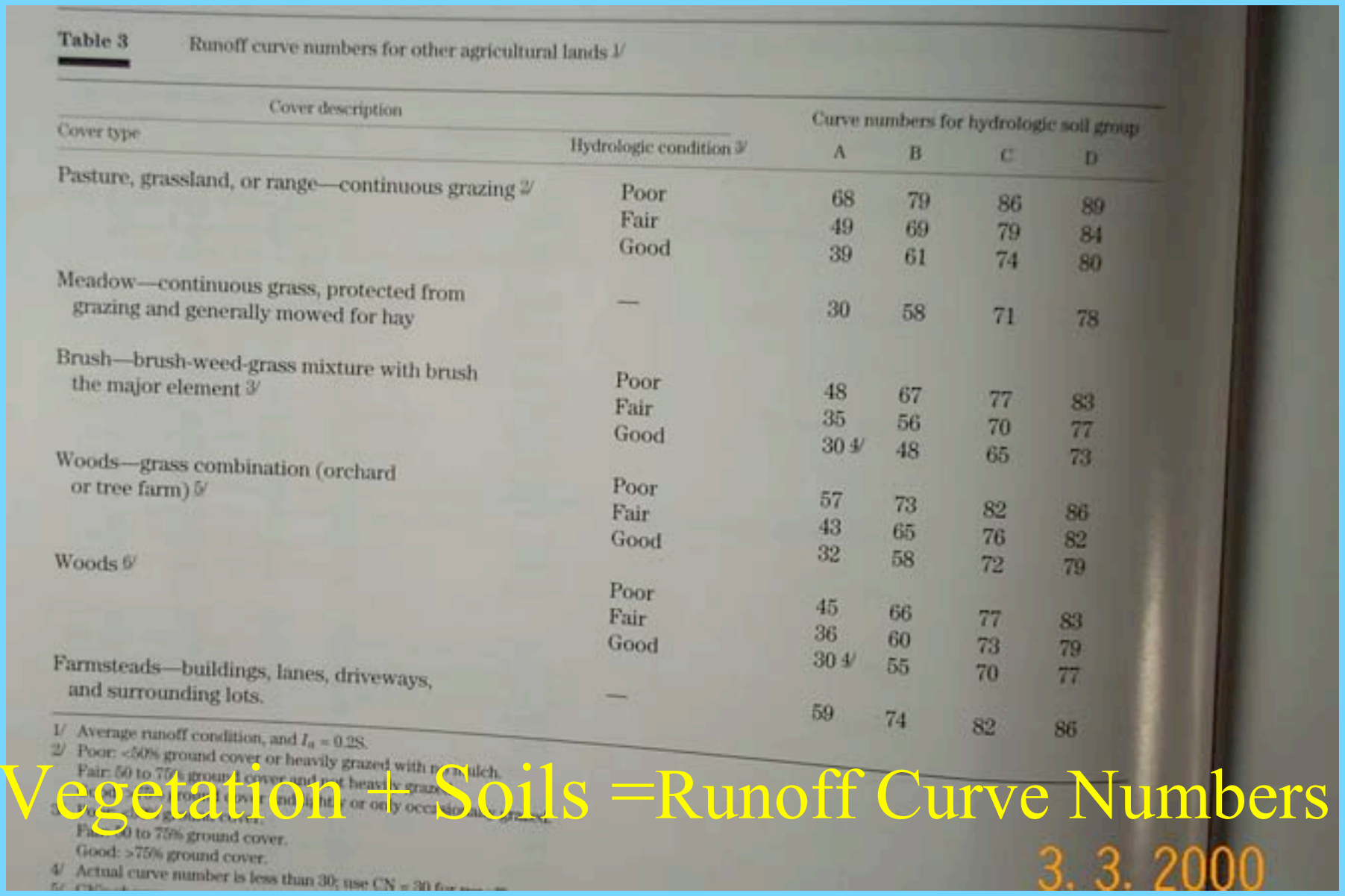


Table 3 Runoff curve numbers for other agricultural lands 1/

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition 3/	A	B	C	D
Pasture, grassland, or range—continuous grazing 2/	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element 3/	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 4/	48	65	73
Woods—grass combination (orchard or tree farm) 5/	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods 5/	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 4/	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

1/ Average runoff condition, and $I_a = 0.2S$.
2/ Poor: <50% ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: >75% ground cover.
4/ Actual curve number is less than 30; use CN = 30 for

Vegetation + Soils =Runoff Curve Numbers

3. 3. 2000

Estimating Storm Runoff

Table 1 Runoff curve numbers for urban areas 1/

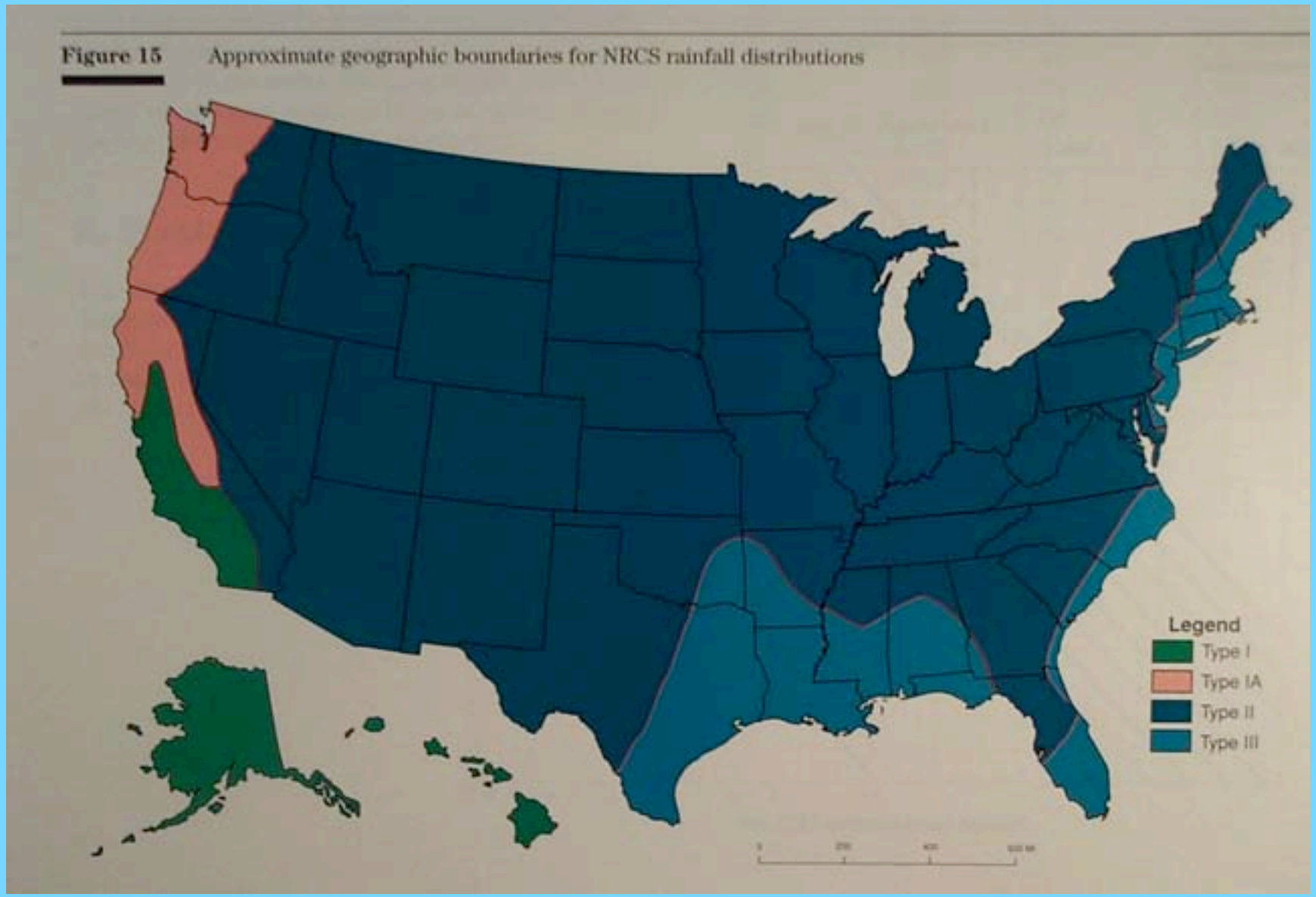
Cover description	Average percent impervious area 2/	Curve numbers for hydrologic soil group A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) 3/					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50 to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) 4/		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)					

Estimating Storm Runoff

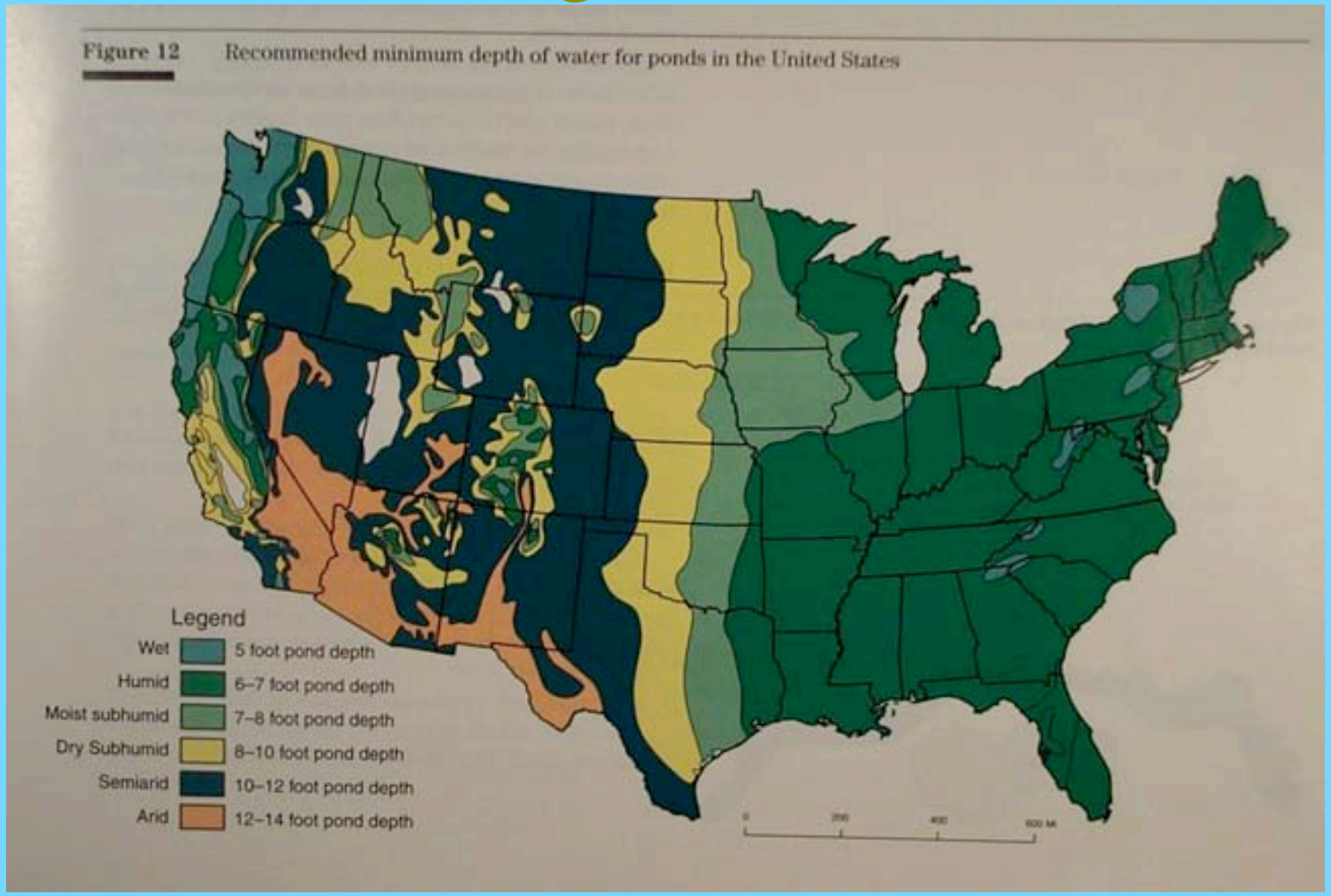
Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment [2]	Hydrologic condition [3]	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T + CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T + CR	Poor	60	71	78	81
		Good	58	69	77	80

3. 3. 2000

Rainfall Volume

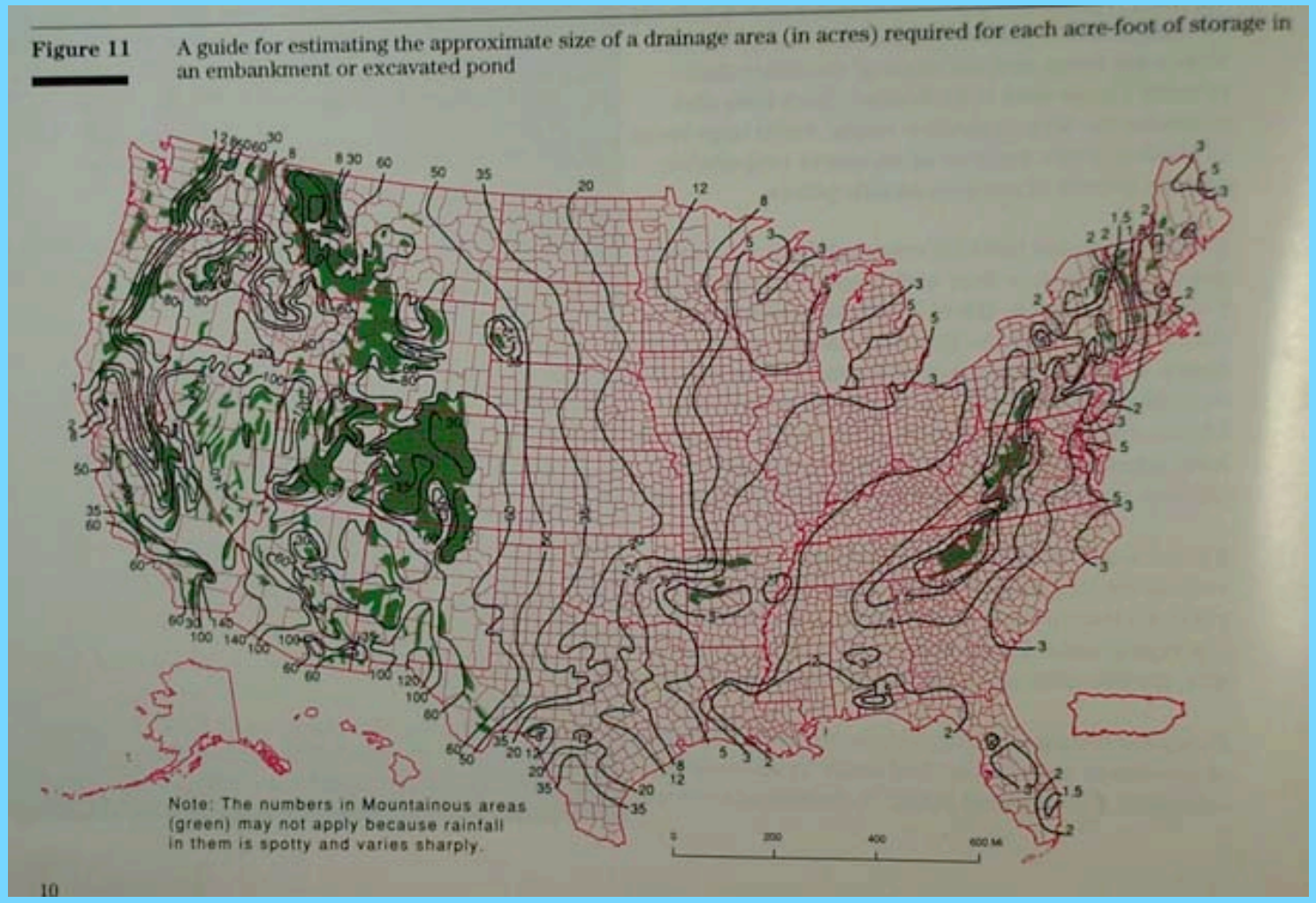


Sizing a Pond



Sizing a Pond

Rainfall frequency and Distribution



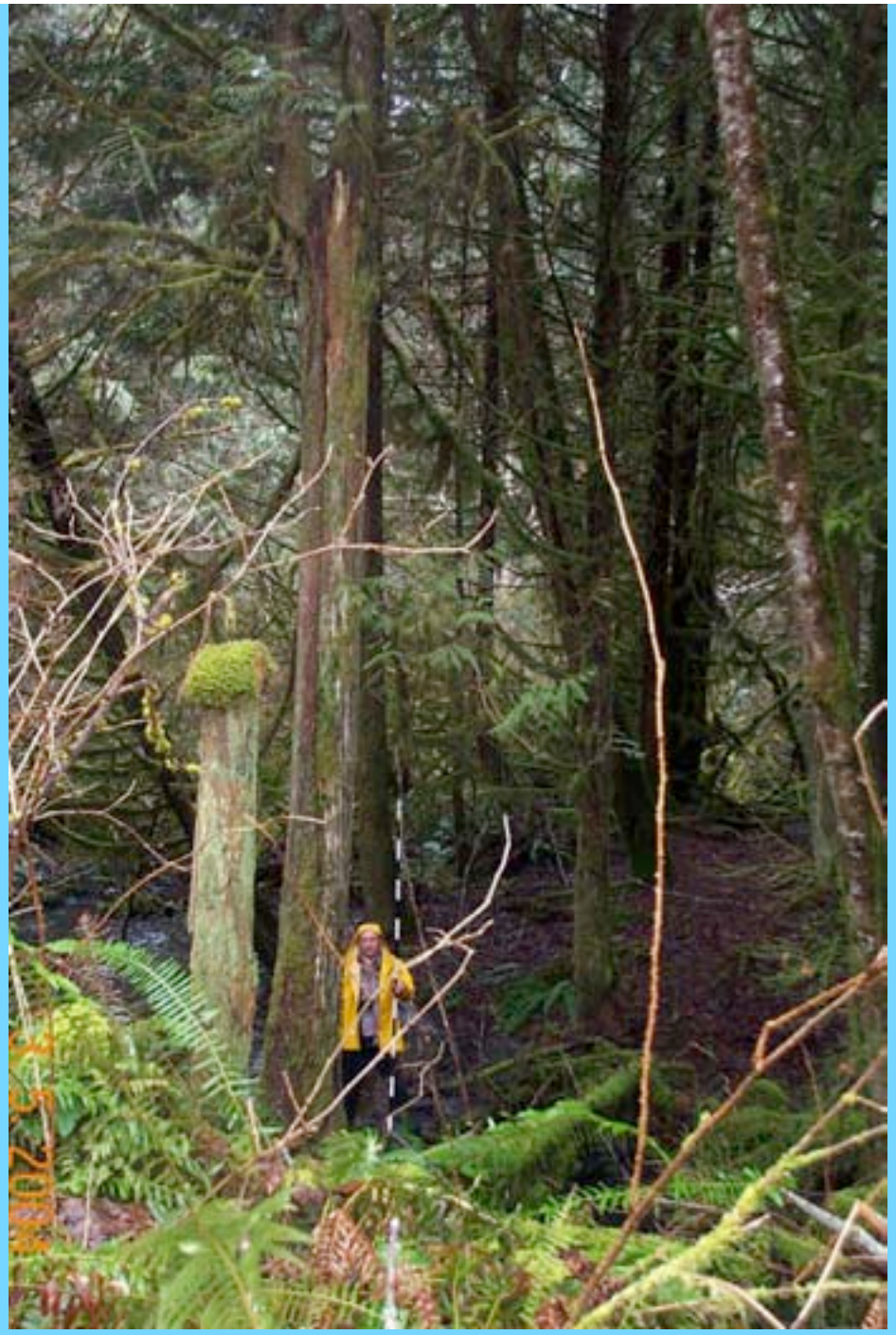
Rainfall frequency and Distribution

3 Major Types

I & IA – Pacific Maritime (wet/dry)

II – Interior of Country

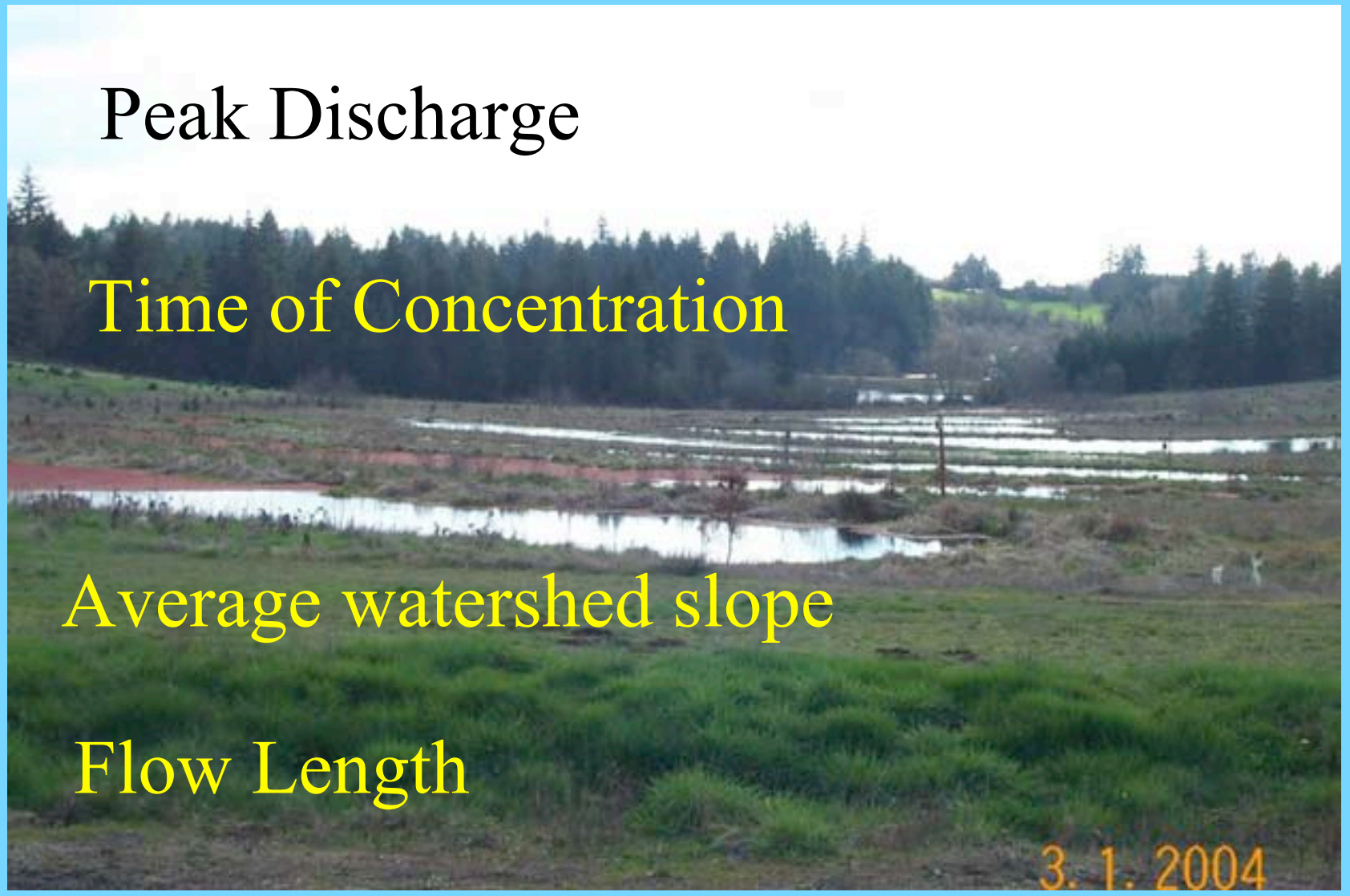
III - Gulf and Atlantic Coastal – (Heavy)



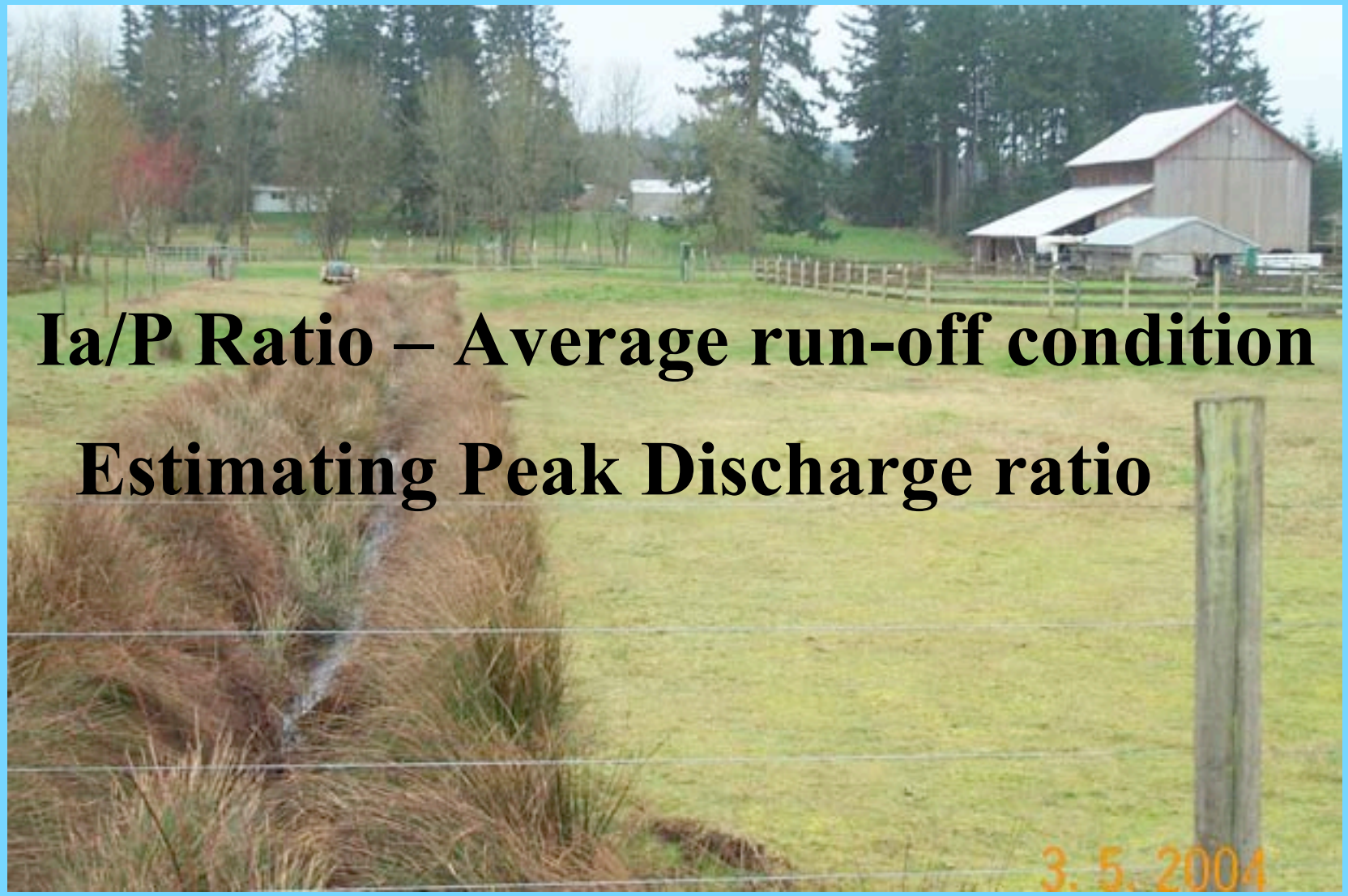
Dam Size

Need for engineering

Calculations



Calculations



Calculations

Table 5 Runoff depth, in inches

Rainfall (inches)	Curve number						
	60	65	70	75	80	85	90
1.0	0	0	0	0.03	0.08	0.17	0.32
1.2	0	0	0.03	0.07	0.15	0.28	0.46
1.4	0	0.02	0.06	0.13	0.24	0.39	0.61
1.6	0.01	0.05	0.11	0.20	0.34	0.52	0.76
1.8	0.03	0.09	0.17	0.29	0.44	0.65	0.93
2.0	0.06	0.14	0.24	0.38	0.56	0.80	1.09
2.5	0.17	0.30	0.46	0.65	0.89	1.18	1.53
3.0	0.33	0.51	0.72	0.96	1.25	1.59	1.98
4.0	0.76	1.03	1.33	1.67	2.04	2.46	2.92
5.0	1.30	1.65	2.04	2.45	2.89	3.37	3.88
6.0	1.92	2.35	2.87	3.28	3.78	4.31	4.85
7.0	2.60	3.10	3.62	4.15	4.69	5.26	5.82
8.0	3.33	3.90	4.47	5.04	5.62	6.22	6.81
9.0	4.10	4.72	5.34	5.95	6.57	7.19	7.79
10.0	4.90	5.57	6.23	6.88	7.52	8.16	8.78
11.0	5.72	6.44	7.13	7.82	8.48	9.14	
12.0	6.56	7.32	8.05	8.76	9.45	10.32	

3. 3. 2000

Calculations

Ia/P Ratio - Average run-off condition

Table 6 I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	70	0.857
41	2.878	71	0.817
42	2.762	72	0.778
43	2.651	73	0.740
44	2.545	74	0.703
45	2.444	75	0.667
46	2.348	76	0.632
47	2.255	77	0.597
48	2.167	78	0.564
49	2.082	79	0.532
50	2.000	80	0.500
51	1.922	81	0.469
52	1.846	82	0.439
53	1.774	83	0.410
54	1.704	84	0.381
55	1.636	85	0.353
56	1.571	86	0.326
57	1.509	87	0.299
58	1.448	88	0.273
59	1.390	89	0.247

Peak Discharge

Figure 17a Unit peak discharge (q_u) for Type I storm distribution

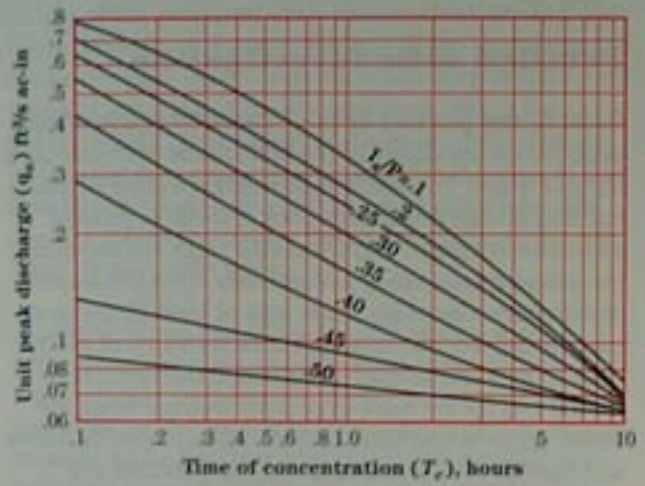


Figure 17c Unit peak discharge (q_u) for Type II storm distribution

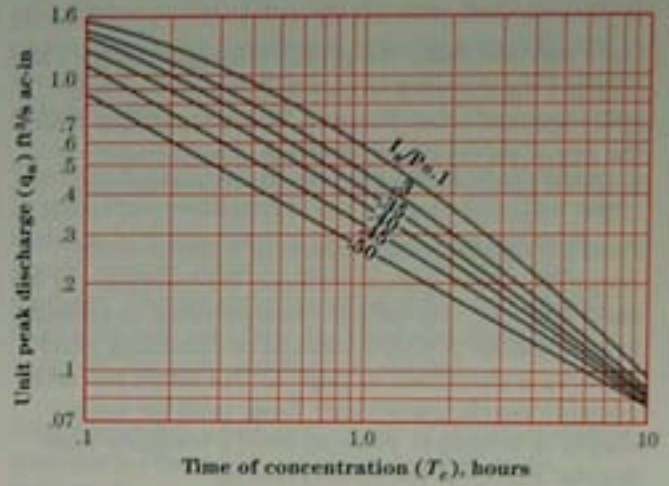


Figure 17b Unit peak discharge (q_u) for Type IA storm distribution

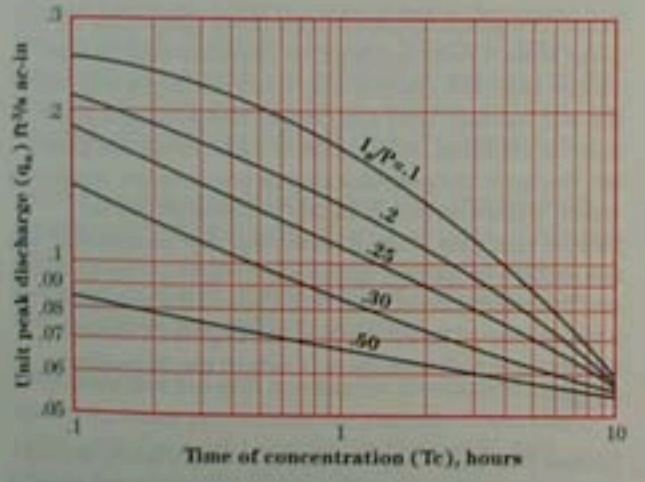
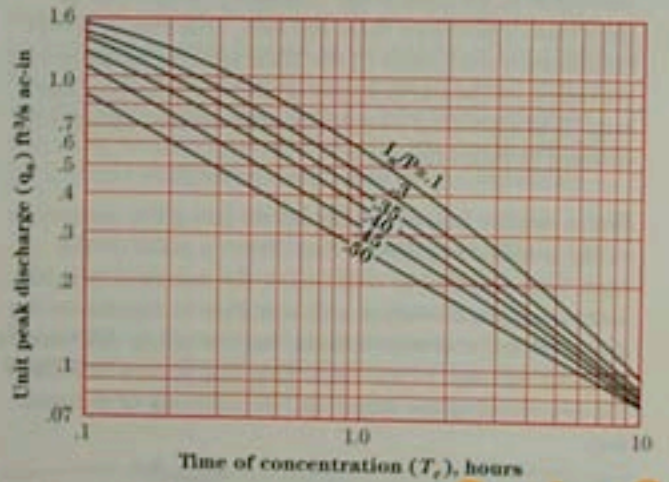
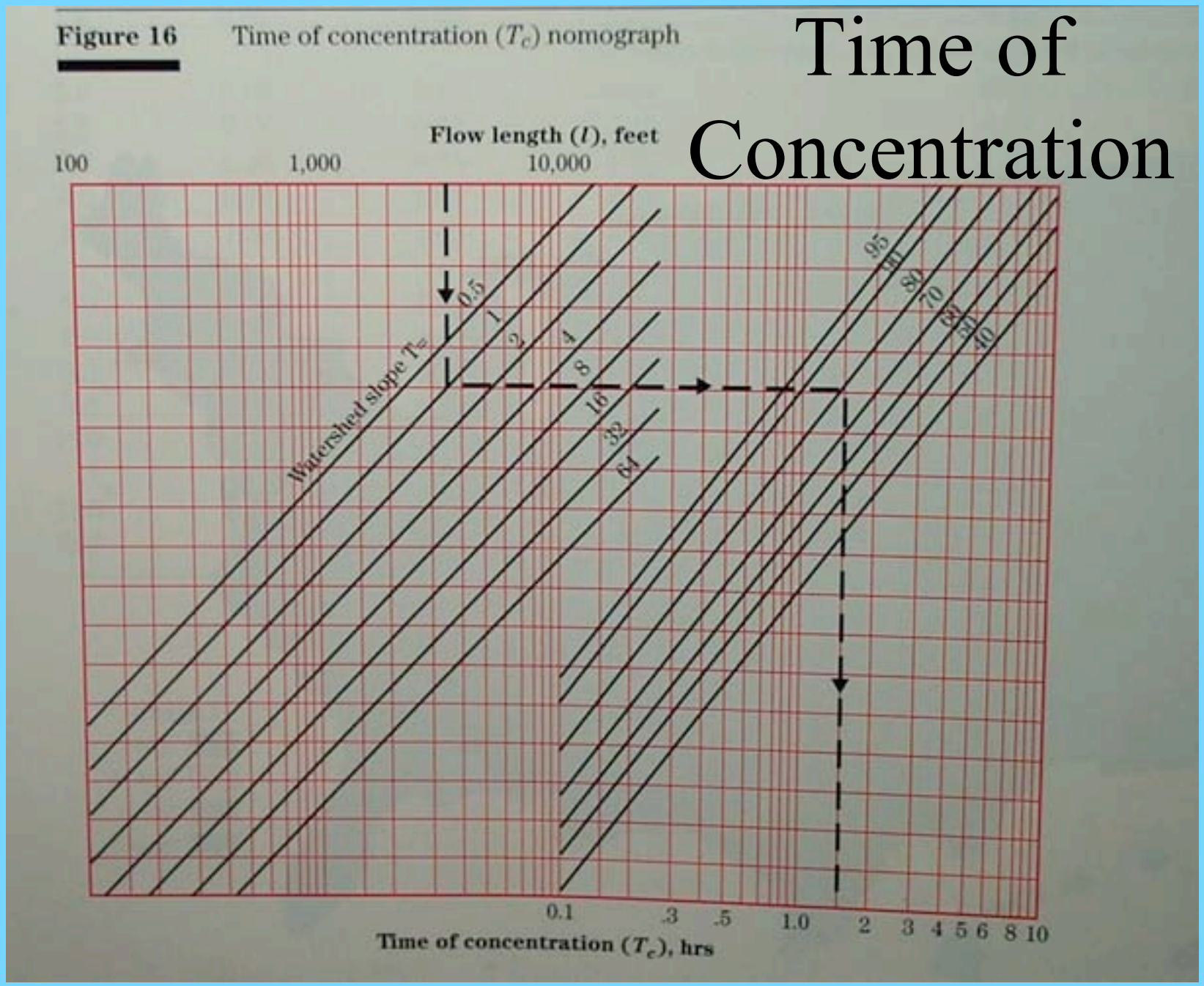


Figure 17d Unit peak discharge (q_u) for Type III storm distribution



Time of Concentration



Site Surveys

Detailed Soil Investigation

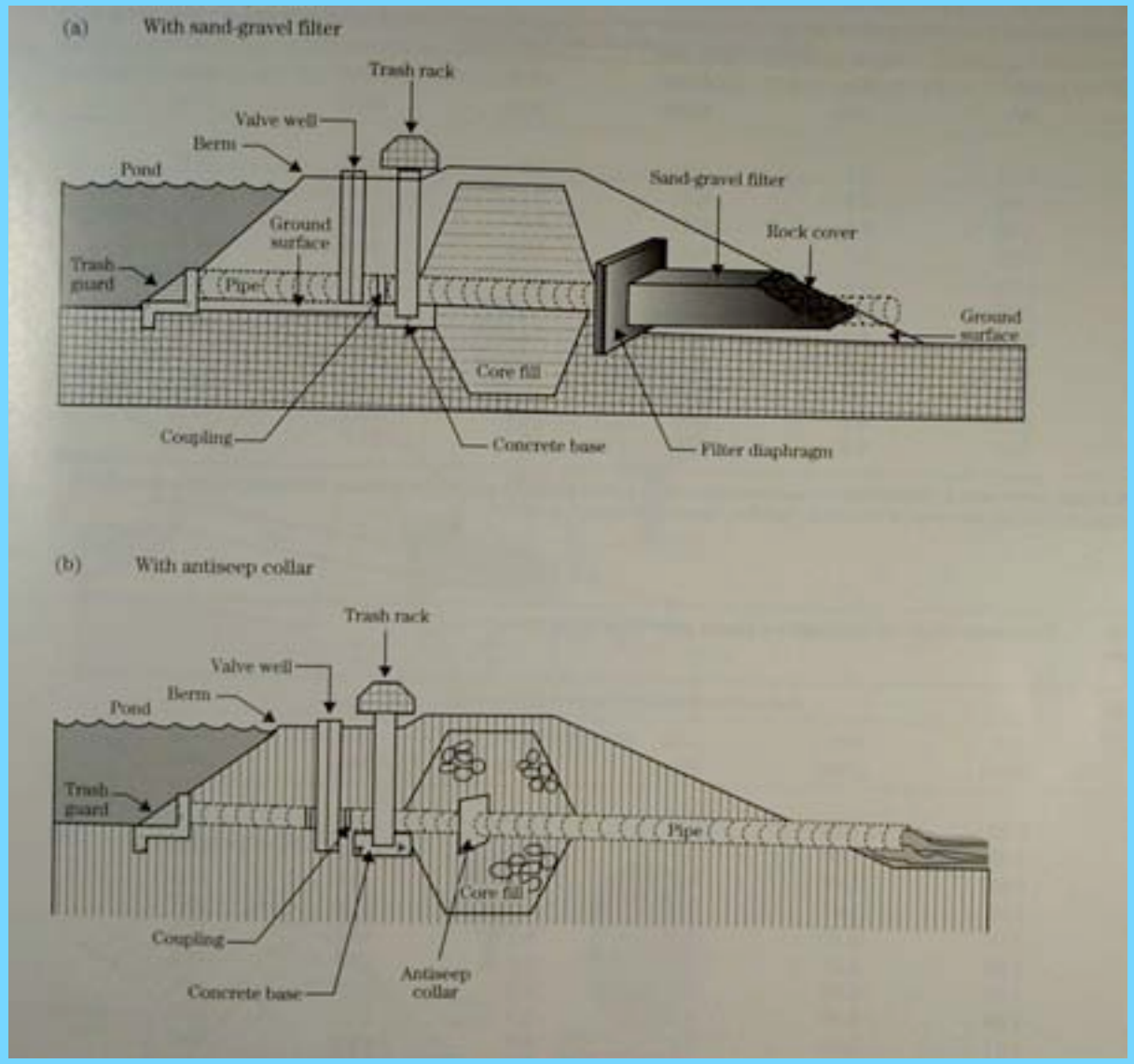
Foundation Conditions

Fill Material

Spillway requirements

Spillway erosion protection

Water Level Control



Pipes through the dam

Pipe inlet protection

Earthen Dam

Foundation

Cutoffs

Top width and alignment

Side slopes

Earthen Dam

Freeboard

Settlement

Volume of earthfill and quality

Dam Construction

Staking

Cleaning and grubbing

Prep on foundation

Pipe spillway installation

Excavating the earth spillway

Dam Construction

Pipe spillway installation

Time to use those calculations

Concrete vs rock (size)

Energy dissipation - baffles

Excavated Ponds

Planning

Soils

Spillway

Selective Dimensions

Estimating Volume

Excavated Ponds

Waste material = spoils

Sealing

Compaction

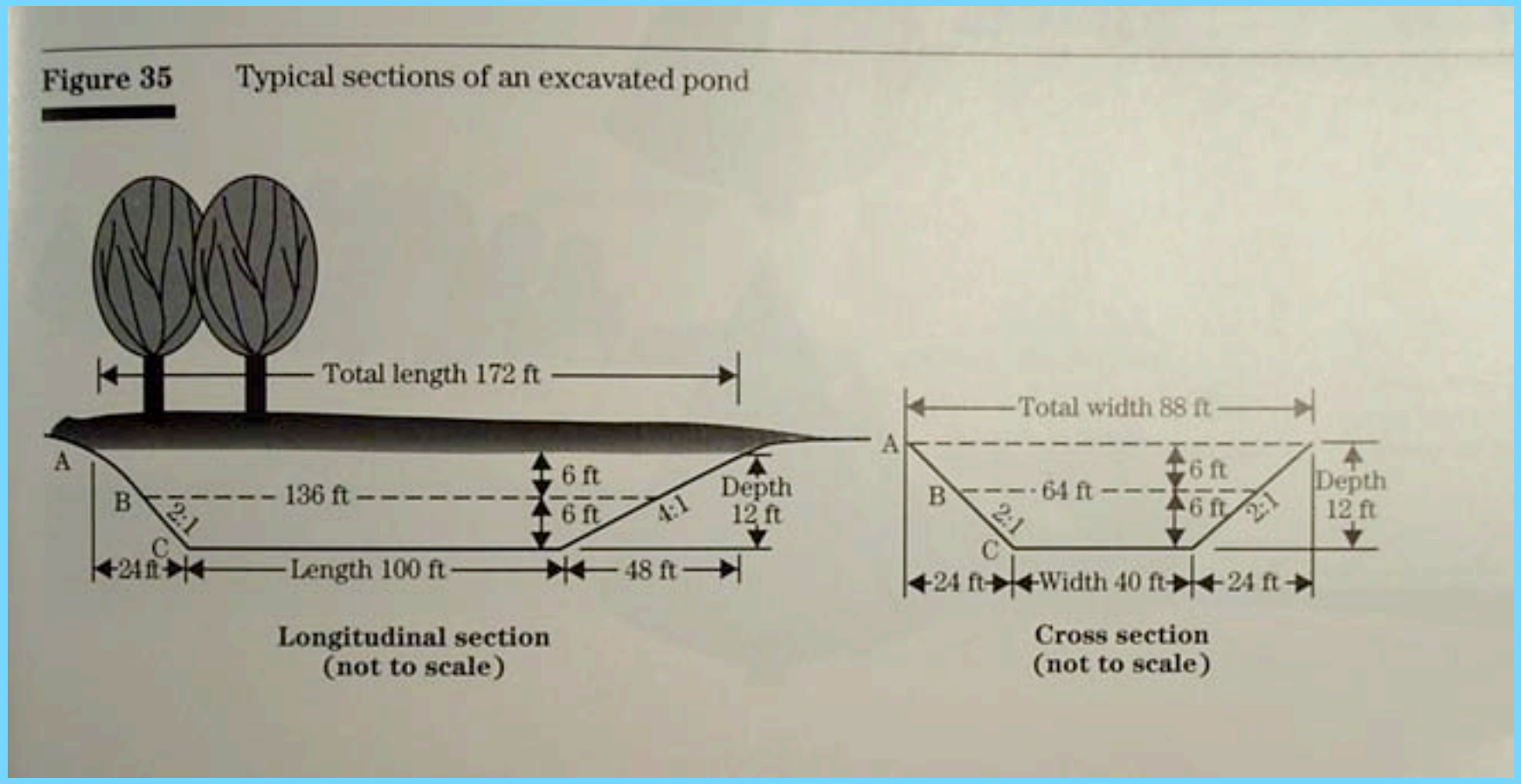
Clay Blankets

Bentonite

Chemical Additives

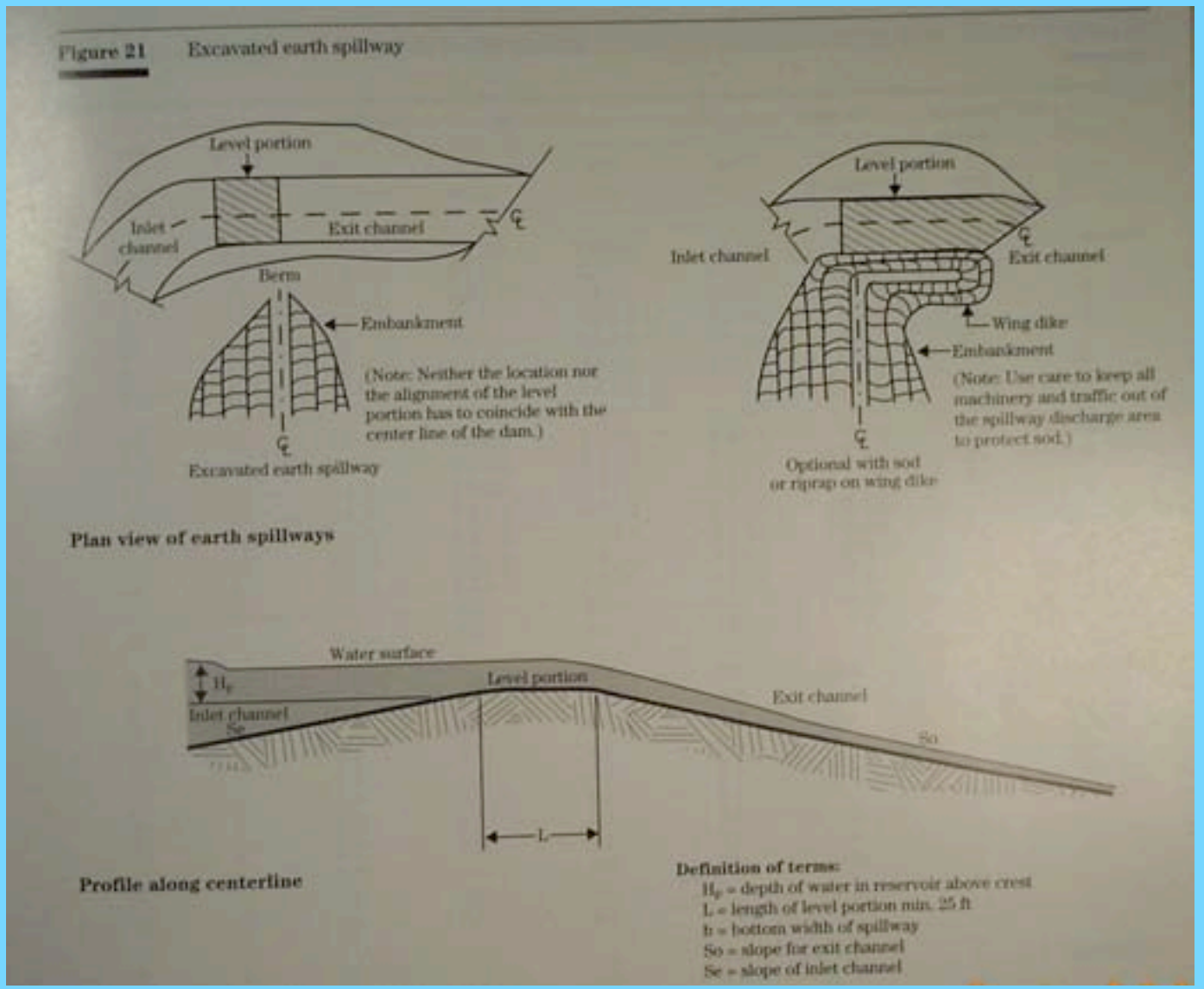
Liners

Excavated Ponds



Beware of slope for children, pets and wildlife.

Excavated Ponds



Finishing


Vegetation
Wave action
Multiple use – Swimming
– Livestock
- Agr. Chemicals

Safety

Boats, poles, life rings

West Nile Virus

Transmittal Mosquitoes Birds

West Nile Virus

Bt- israeliensis

Gambusia

Stagnant water

Maintenance

Dam – Piping

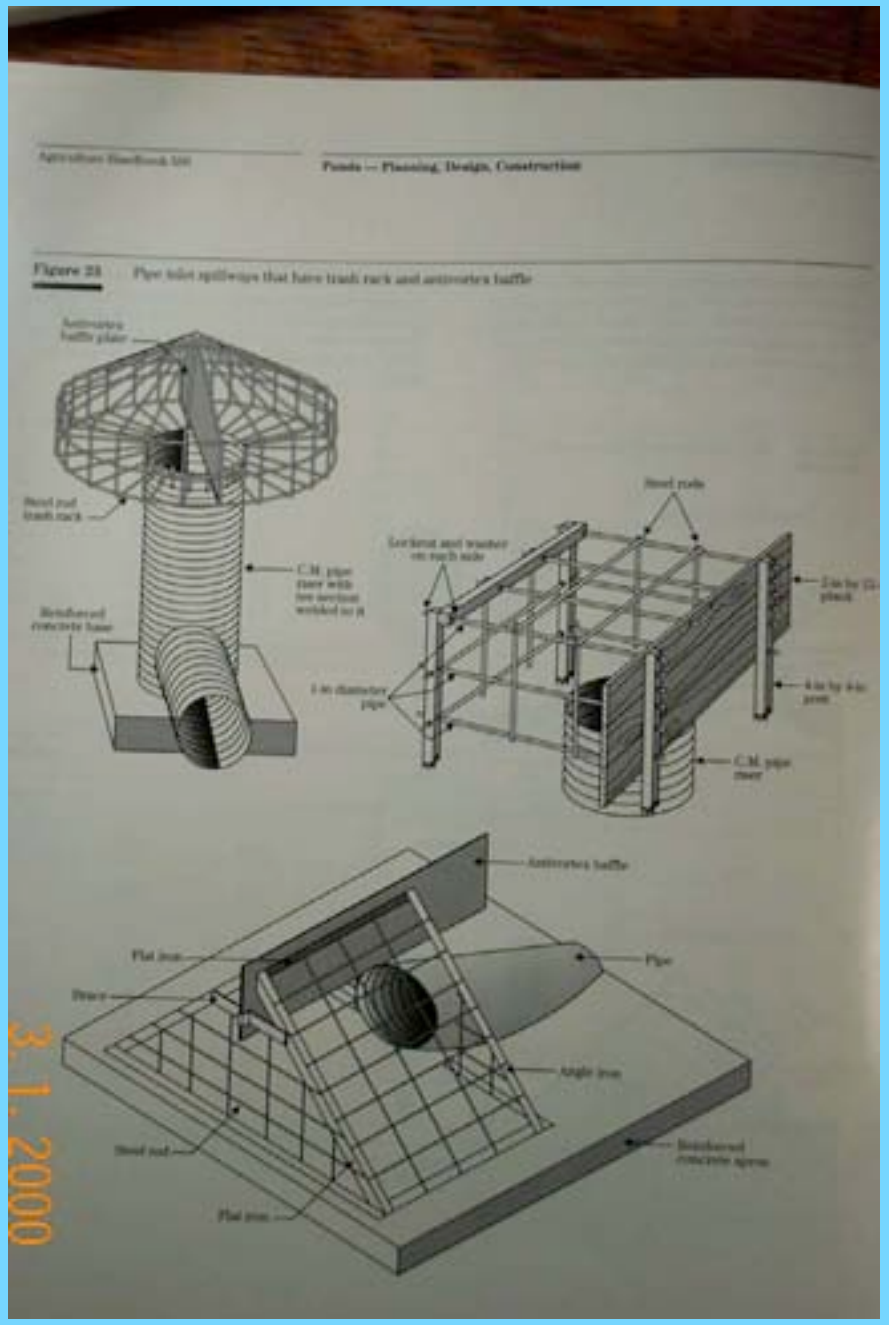
Nutria,

tree roots,

improper drains,

pipe installation

Maintenance



Maintenance

Spillway protection

Valves

Maintenance

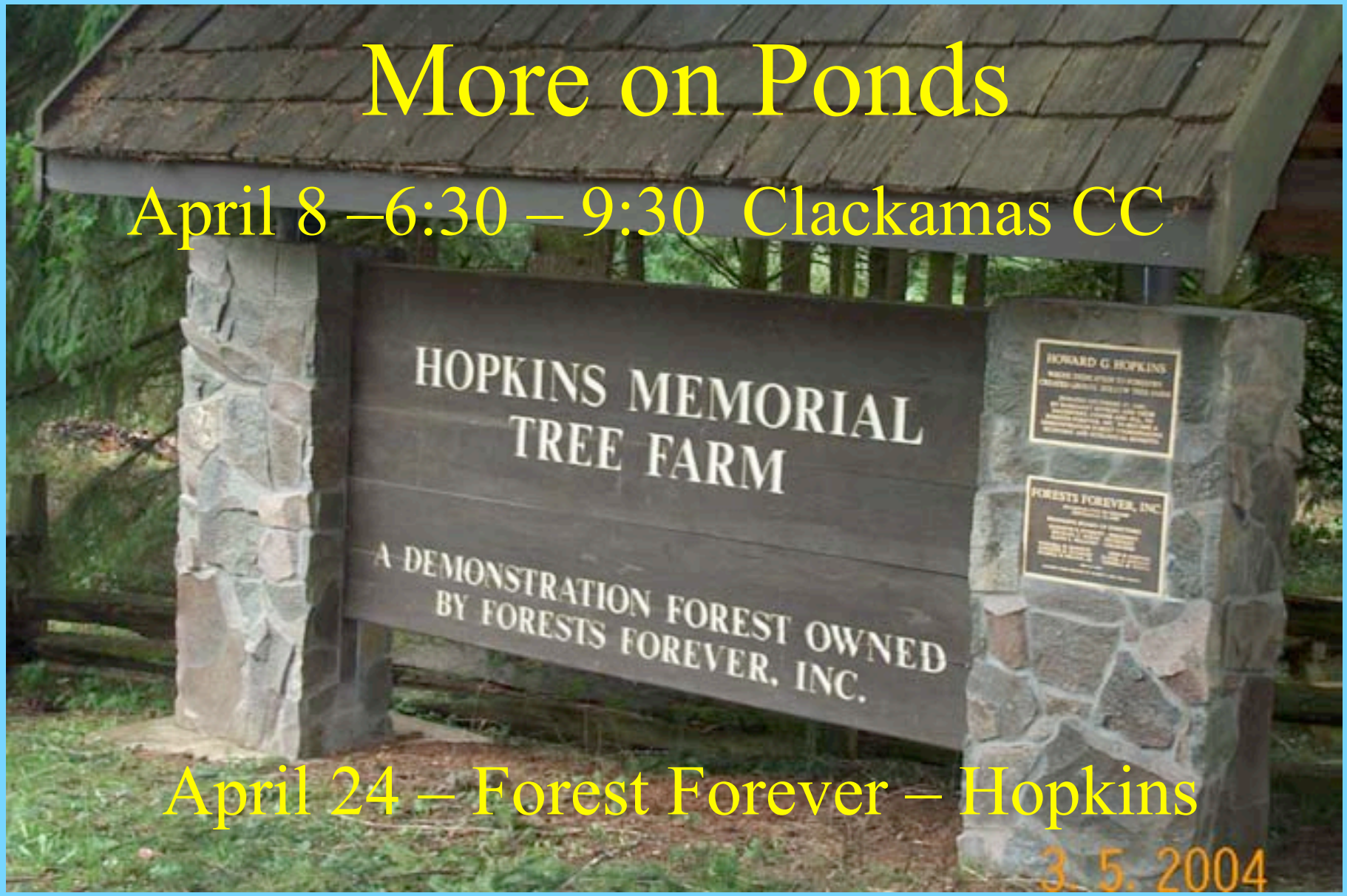
Spillway and drain pipe problems

Maintenance

Sediment

More on Ponds

April 8 –6:30 – 9:30 Clackamas CC



April 24 – Forest Forever – Hopkins


3. 8. 2004