Part 503 – Then & Now

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40 CFR Part 503

Standards for the Use or Disposal of Sewage Sludge (SS)

Enacted February 1993

SS = Solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works

Biosolids = Sewage sludge which has been treated to meet the land application requirements of part 503

Specifies requirements for three management options:

- Land application
- Incineration
- Surface disposal

Rules and Standards

40 CFR Part 503

Requirements focus on the generator, user, recycler, disposer of sewage sludge/biosolids

- General requirements
- Numeric limits
- Management practices
- Operational standards
- Monitoring
- Recordkeeping
- Reporting

40 CFR Part 503

Self-implementing rule

- Federally enforceable without a permit

States have adopted Part 503 or something more restrictive

- Typically additional requirements address environmentally sensitive areas (e.g., shallow ground water)
- Eight states are formally delegated (UT, OK, WI, TX, AZ, OH, MI)

Choice of use or disposal practice is a local decision –

"EPA Interpretation an issue as it relates to local ordinances"

BIOSOLIDS QUALITY

- **Metal Concentrations**
  - Pollutant limits (HQ)
  - Ceiling limits
- **Pathogen Control**
  - Class A
  - Class B
- **Vector Attraction Reduction**
  - Process
  - Physical barrier

Land Application Pollutant Limits
(all weights are on dry weight basis)

Table in 503 Rule	Table #1	Table #2	Table #3	Table #4
Pollutant	Ceiling Concentration Limits* (mg/kg)	Cumulative Pollutant Loading Rates (kg/ha)	"High Quality" Pollutant Concentration Limits** (mg/kg)	Annual Pollutant Loading Rates (kg/ha/yr)
Arsenic	75	41	41	2.0
Cadmium	85	39	39	1.9
Chromium	[redacted]	[redacted]	[redacted]	[redacted]
Copper	4,300	1,500	1,500	75
Lead	840	300	300	15
Mercury	57	17	17	0.85
Molybdenum	75	[redacted]	[redacted]	[redacted]
Nickel	420	420	420	21
Selenium	100	100	100 [redacted]	5.0
Zinc	7,500	2,800	2,800	140

* absolute values

40 CFR 503
Pathogens / Indicator Organisms

Microbial standards
- ✓ Technology based
- ✓ *Salmonella* sp., fecal coliforms, enteric viruses, viable helminth ova

Class A:
- ✓ <1000 fecal coliform MPN / g (dry weight) or
  <3 *salmonellae* MPN / 4 g (dry weight) and
  PFRP, defined process, PFRP equivalent, or pre/post;
- ✓ <1 PFU enterovirus / 4 g (dry weight)
- ✓ <1 viable helminth ova / 4 g (dry weight)

Class B:
- ✓ Use of a PSRP or equivalent process or
  <2 million fecal coliform / g (dry weight)

Class B Biosolids Land Applied B + Management = A

Public access:

- 30 days – public access when there is a low potential for exposure
- 1 year – public access restriction when there is a high potential for exposure (e.g., turf)

Harvest:

- 30 days – food, feed, fiber crops harvest
- 14 to 38 months – depending on type of food crop and likelihood of touching amended soil

Grazing:

- 30 days – animals not allowed to graze

Vector Attraction Reduction

Employ one of ten options (8 process) designed as:

- Biological processes which break down volatile solids, reducing available nutrients for microbial activities and odor producing potential
  - 38 % VS reduction via treatment
- Chemical or physical conditions which stop microbial activity
  - Alkali to raise pH to at least 12
- Physical barriers between vectors and volatile solids in the sewage sludge
  - Soil barrier

NUTRIENT MGMT

- Site criteria
- Site management
- Nitrogen needs of the crop to be grown
- Soil pH > 5.5

Biennial Review

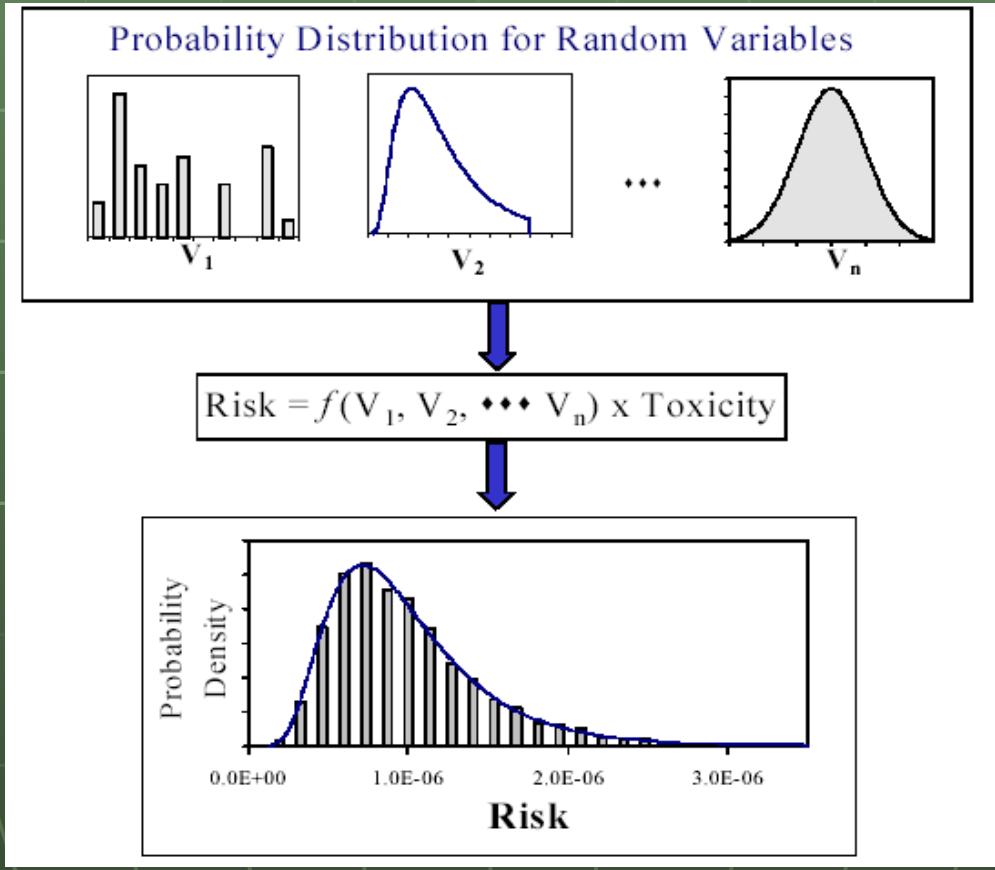
- Required by CWA
- Early review identified Dioxin as constituent of interest (COI)
- Much improved risk assessment model ultimately developed
- 2003 review identified 9 COIs still being assessed

PROBABILISTIC RISK ASSESSMENT

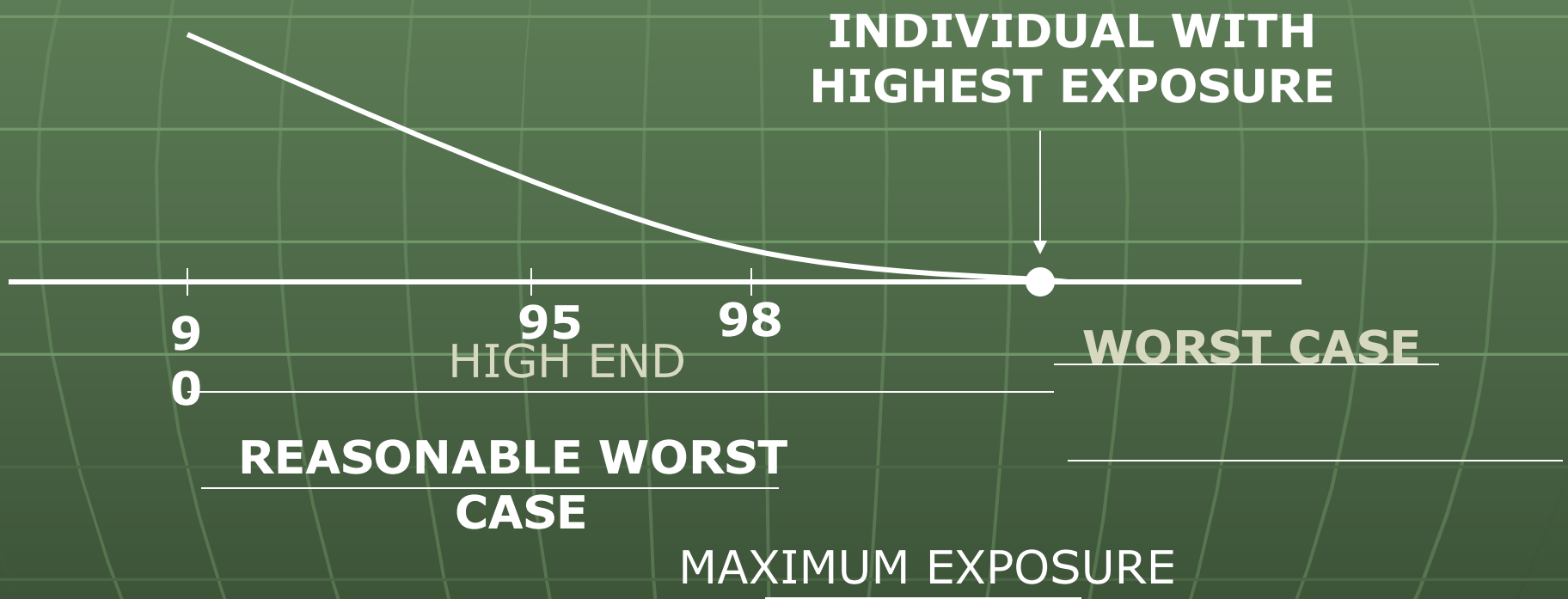
- Use mathematical simulation models to predict risk potential
- Use an array of input variables simultaneously
- Provides tools to better assess variability of risk
- Provides tools to better assess uncertainty

Conceptual Model of Monte Carlo Analysis

USEPA 2001



Exposure Definitions



Land Application Risk Assessment

- Biosolids applied by a "lifestyle" farmer to either pasture or cropland
  - once every two years
  - agronomic rates
- Climate and soil data to characterize the environmental setting and characterize exposure
  - meteorologic
  - climate
- 9 farm resource regions
- 41 climate regions

9 Resource Regions

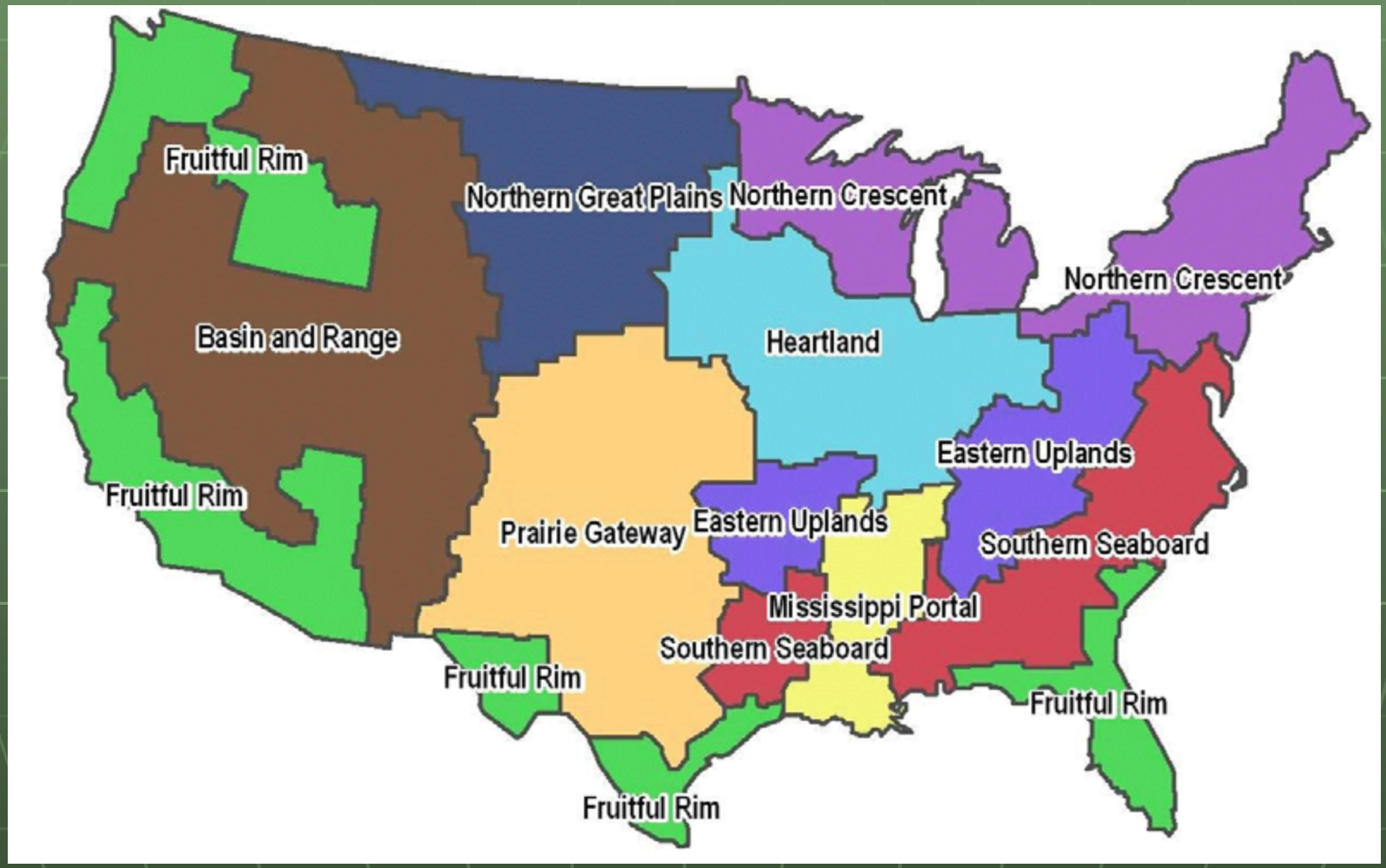
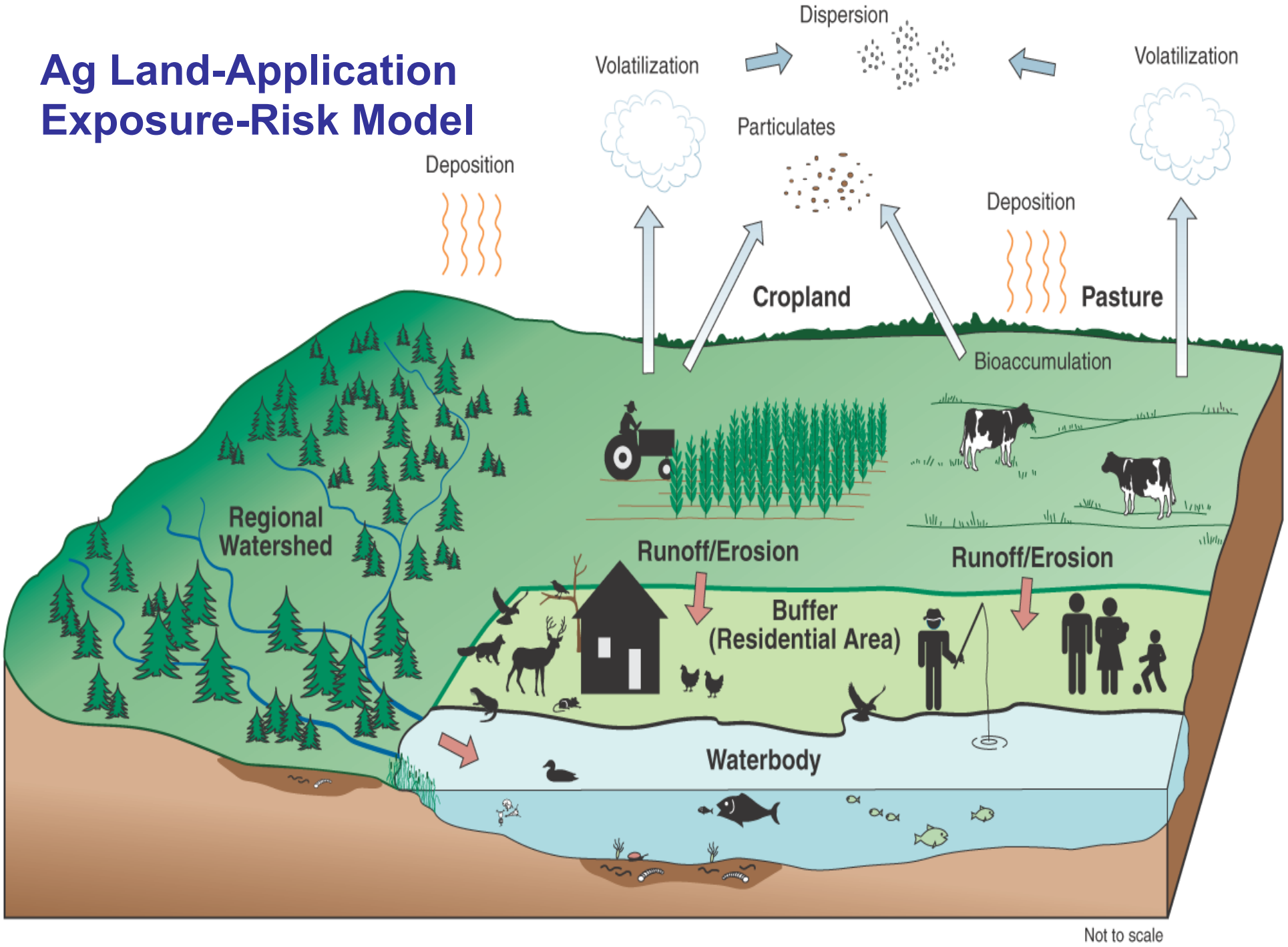


Figure 2-11. Map of the 9 resource regions.

41 Climate Regions

Figure 1.1 Map of 41 climatic regions.

Ag Land-Application Exposure-Risk Model



Q: What Chemicals do we find in the Environment / Biosolids?

A: All the ones we are using (i.e., assuming we are looking for them)

Mostly those that are:

- Mass-produced
- Discharged into wastewater and the environment
- Feature foreign chemical structures (i.e., organohalides / PFCs)

Detection does not automatically imply a problem

2/3 of Biosolids are made up of……..

- Carbon
- Oxygen
- Silicon
- Hydrogen
- Nitrogen
- Sulfur

50%+

Data are medians from the TNSSS 2007

Microconstituents / PPCPs / TORCs / EDCs…

- Interest remains high
  - What is their fate
  - Do they have any impact
  - Illustrate the connection of individuals' activities with their environment
- What does it mean for biosolids management?
  - Similar reactions / processes for all chemicals
  - PBT chemicals present highest level of concern
- Biosolids land application as a tool for managing microconstituents
  - Assimilative capacities of soils
  - Best management practices

Triclosan (TCS)

- Dr. Tom Young – UC Davis -Evaluated CA biosolids and impacts of triclosan on microbial populations
- Found increase in population density and diversity even though TCS on own is toxic
- Key is all other COIs should also have been present, though not focus

A Snapshot of Antibiotic Use

Europe

10,900 tons combined Use (1998)

- 7000 tons-human use
- 3900 tons-animal use

United States

12,000 tons combined Use (1997)

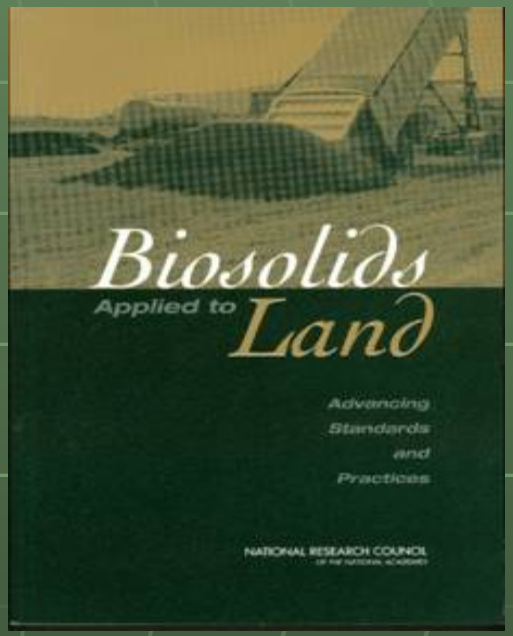
4800 tons-human use

7200 tons-animal use

Is the Current Framework Protective?

We believe Part 503 is protective

"No documented evidence to indicate that Part 503 has failed to protect public health" (NAS Report , 2002)



But work must continue

"However, additional scientific work is needed to reduce persistent uncertainty about the potential for adverse health effects from exposure to biosolids" (NAS Report, 2002)