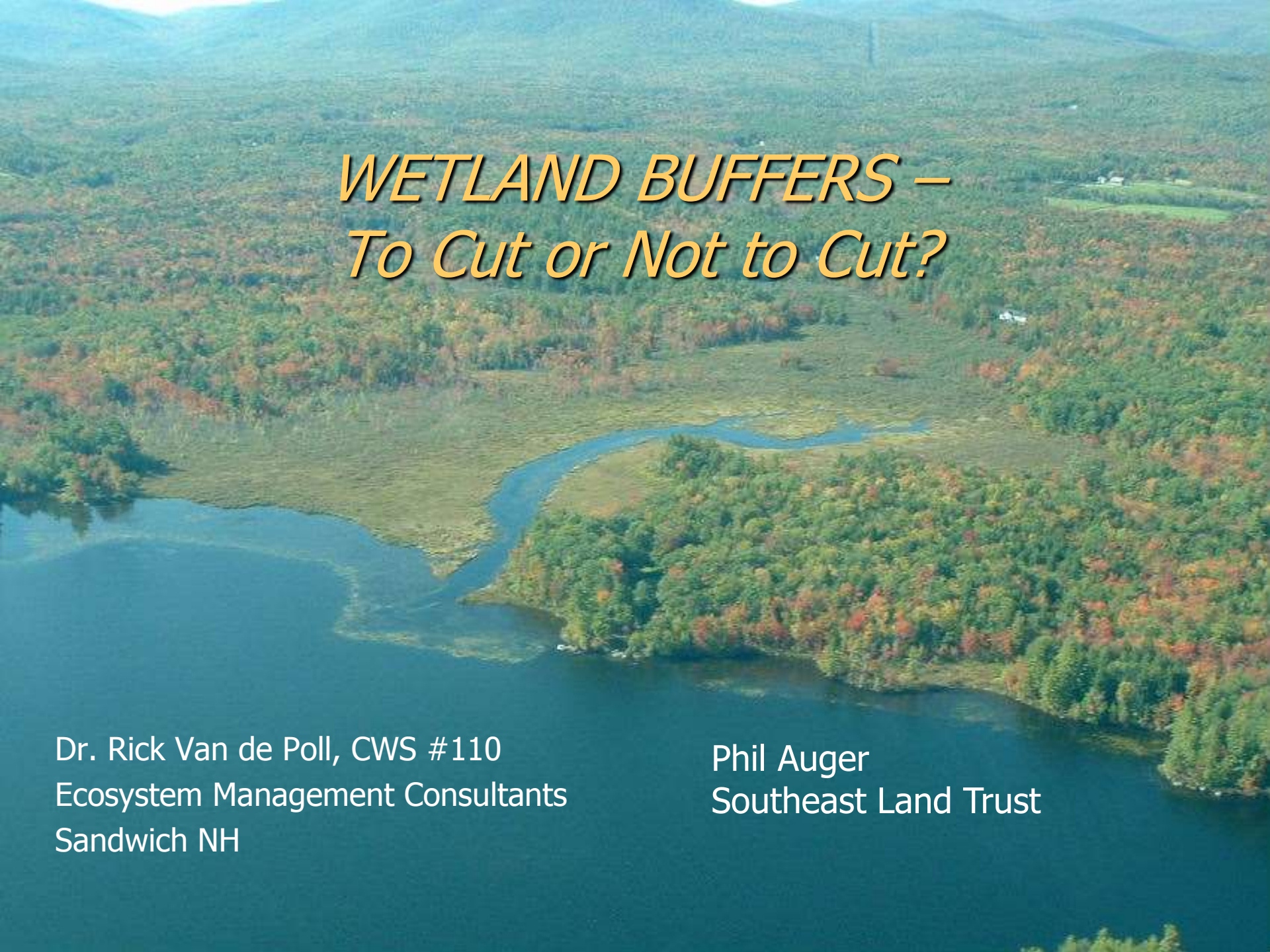

WETLAND BUFFERS – To Cut or Not to Cut?

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What Are Wetland Buffers?

"A naturally vegetated upland area adjacent to a wetland or surface water"

Chase, Deming & Latawiec (NHOSP) 1995

"Vegetated zones located between natural (water) resources and adjacent areas subject to human alteration"

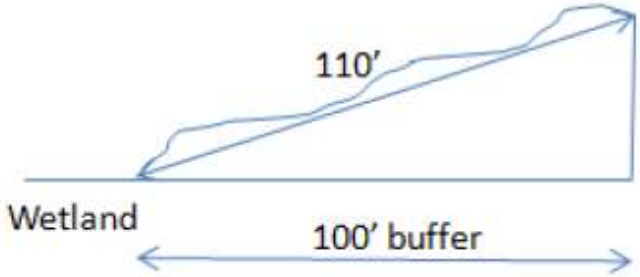
Castelle, Johnson, & Connolly 1994

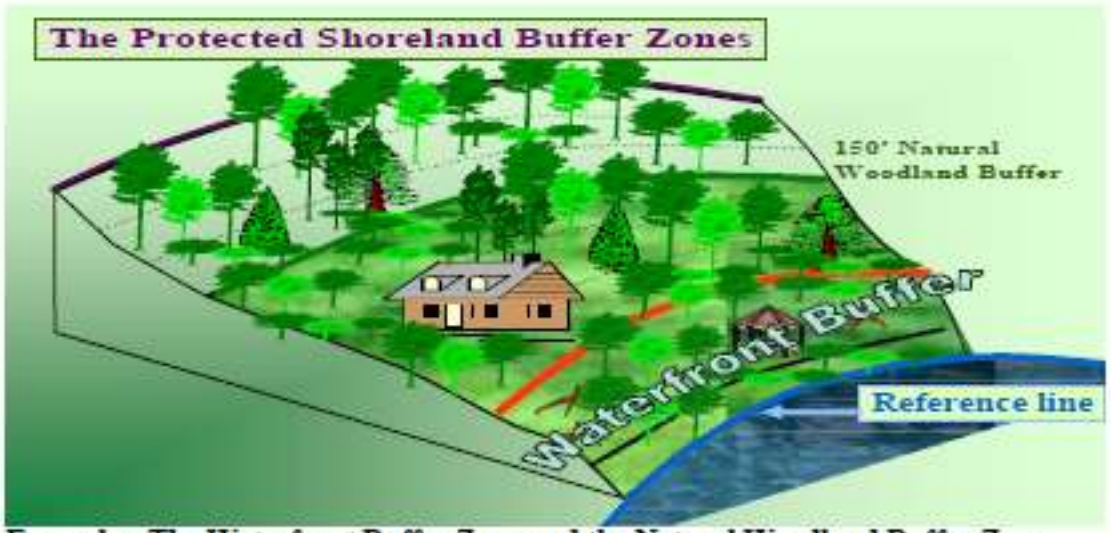
In this case, What do we mean by Wetlands?

"Surface waters of the state" means perennial and seasonal streams, lakes, ponds, and tidal waters within the jurisdiction of the state, including all streams, lakes, or ponds bordering on the state, marshes, water courses, and other bodies of water, natural or artificial.

RSA 485-A:2, XIV

How Are Surface Water Buffers Typically Applied?



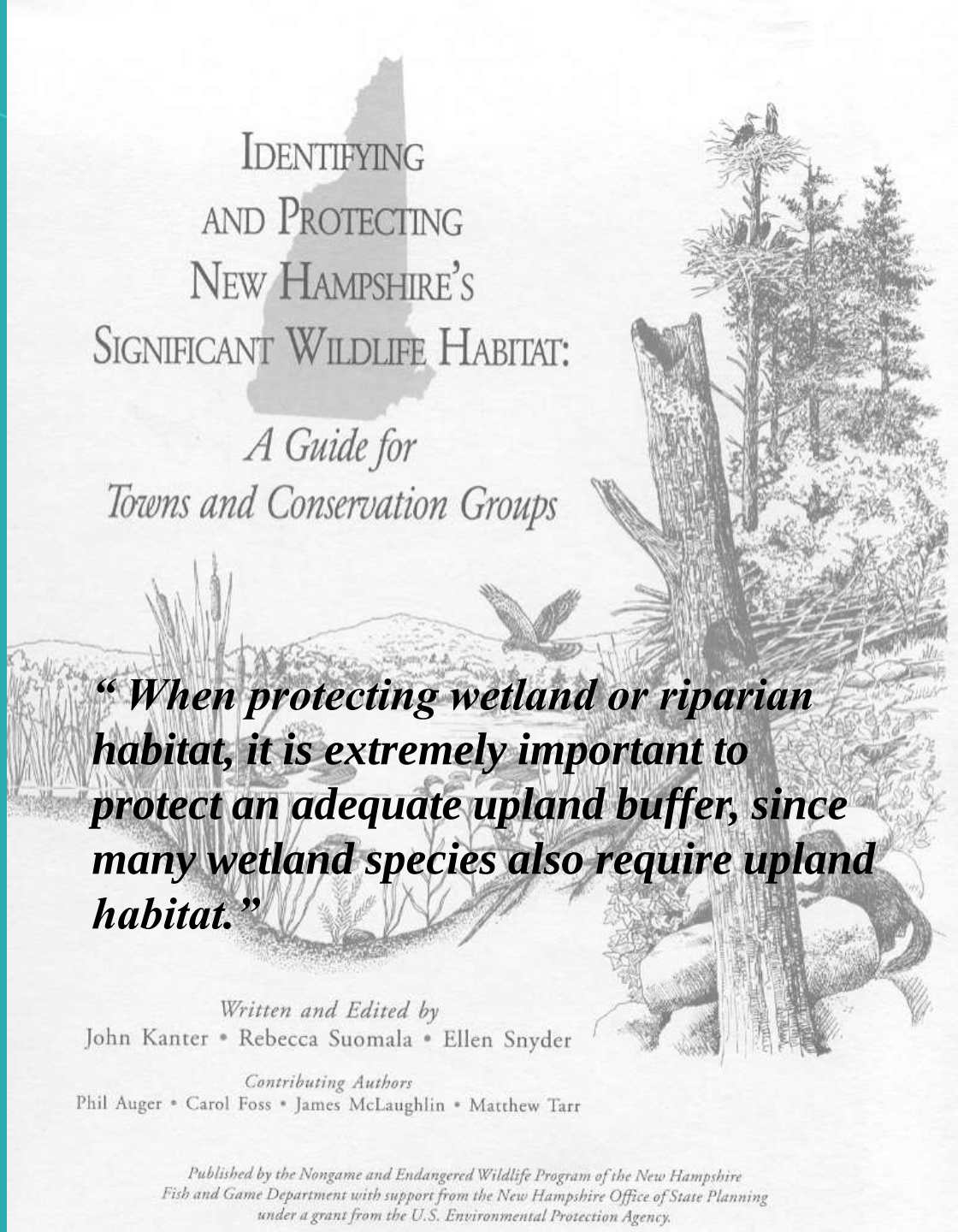


Example: The Waterfront Buffer Zone and the Natural Woodland Buffer Zone

Why Protect Wetland Buffer Zones ?

1) Wildlife Habitat
2) Flood Storage and Desynchronization
3) Groundwater Recharge/Discharge
4) Nutrient Transformation
5) Sediment Trapping
6) Recreational Use
8) Education & Research
9) Streambank/shoreline stabilization
10) Production Export
11) Uniqueness / Heritage
12) Endangered Species Habitat
13) Scenic/Aesthetic Qualities

1) Wildlife Habitat



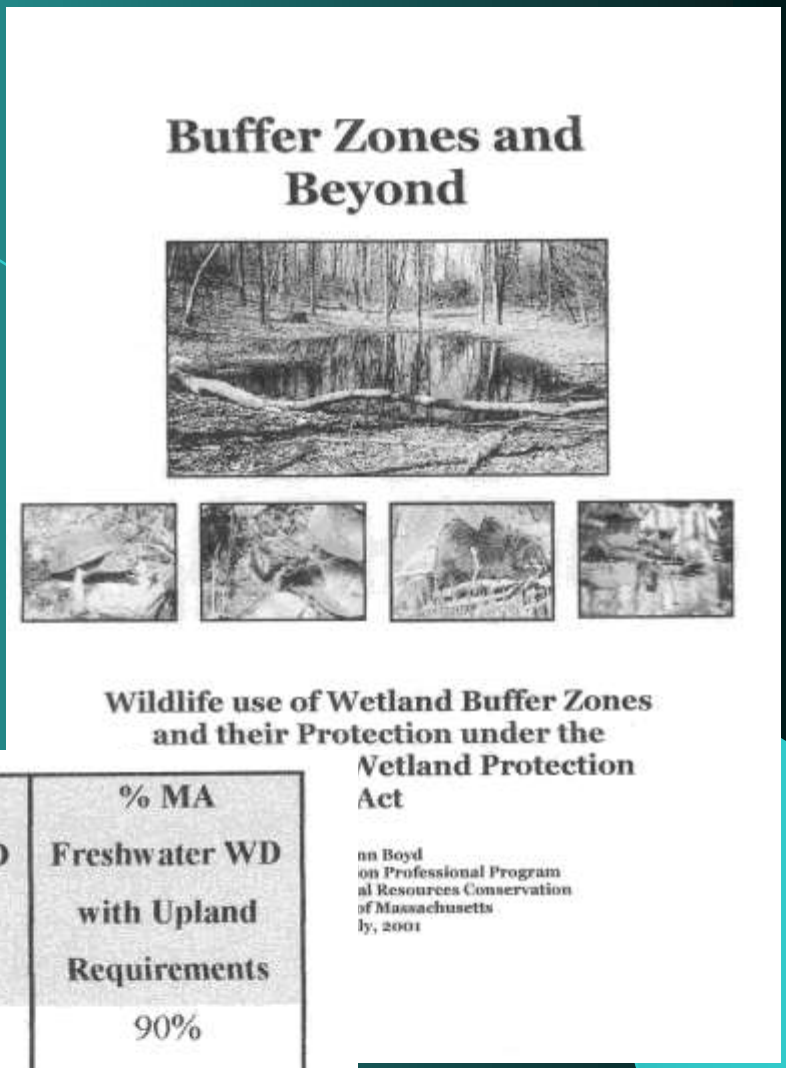
Buffer Zones: Direct Benefits to Wildlife

- Direct access to water
- Greater amount of food resources
- Higher density of vegetative cover
- Replenishment of CWM to streams & rivers
- Increased shade, cooler water temperatures
- Higher diversity of food, water, & shelter needs
- Greater reproductive potential for water-dependent wildlife
- Direct access to migratory pathways

Sample Wildlife Minimum Travel Distances within Wetland Buffers

- Ambystomid salamanders: 538.1 ft (Semlitch 1998)
- Bird Communities in Hemlock Forest: 410.1 ft (Cronquist and Brooks 1993)
- Bald Eagle nesting: 600 ft (Roderick and Miller 1991)
- Freshwater Turtles in SC: 902.2 ft (Burke and Gibbons 1995)
- Wood Frogs: 1100 m for metapopulation purposes (Calhoun et al. 2004)
- Blanding's Turtles: 30 – 500 m interpool migration; >1000 m for out-migrating gravid females (Kiviat 1997)

Wildlife Species with Buffer Requirements



	Species with Upland Requirements	Species Without Upland Requirements	Total MA Freshwater WD Species*	% MA Freshwater WD with Upland Requirements
Reptiles	9	1	10	90%
Amphibians	19	1	20	95%
Mammals	14	0	14	100%
Birds	23	19	42	55%
Totals	65	21	86	76%

* See Appendix A for development of these numbers.

2) Flood Storage and Desynchronization

- Vegetated buffer zone provides physical barriers to moving floodwaters & ice
- Stabilized floodplain channels store water
- Permeable soils and dense vegetation absorb water

Historic Flooding in Keene – Pre-1938

The lower sections of Keene were hit by flooding as Otter Brook and the Minnewawa River converged. Otter Brook reached a record rising just a few tenths of an inch higher then the 1936 flood height which had been accentuated by an ice jam. (Granite State Studios)

More recent flooding in Keene (2005)

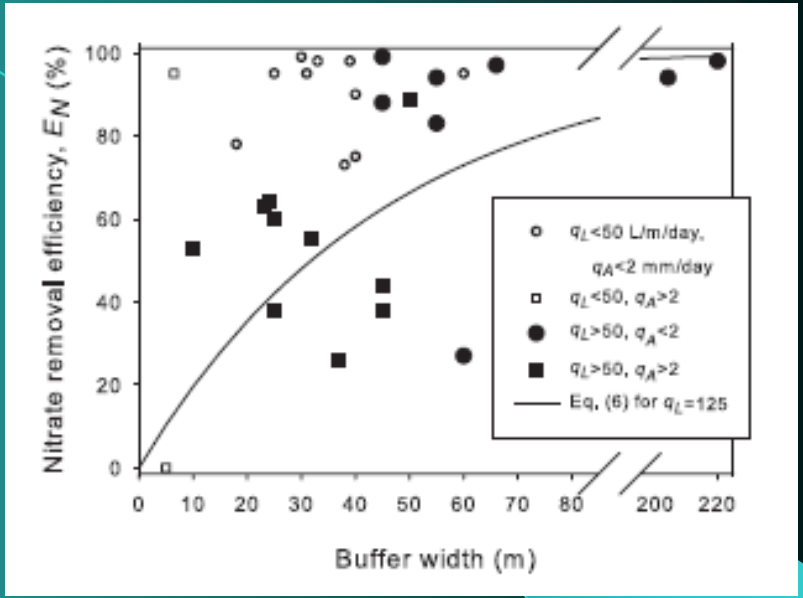
Courtesy Emily Hague

4) Nutrient Transformation

- Based on soil morphology & inputs from surrounding area
- Reducing (aquic) conditions control chemical uptake
- Typically thick organic surface layers have less absorptive or buffering capacity
- Mineral soil layers chemically reduce and/or oxidize transported nutrients
- Greatest attenuation occurs in areas with dense, fibrous plant roots
- Nutrient release occurs following reduction in above-ground biomass (From Hubbard Brook studies)

4) Nutrient Transformation

- Sub-surface nitrate removal varies inversely with groundwater flux
- Sites with a subsurface water flux of >50 /m/day had a median of 55% nitrate removal with buffers < 40 m and 89% for buffers > 40 m
- Sites with a subsurface water flux of < 50 l/m/day had a range of 73% to 99% removal for buffers < 40 m



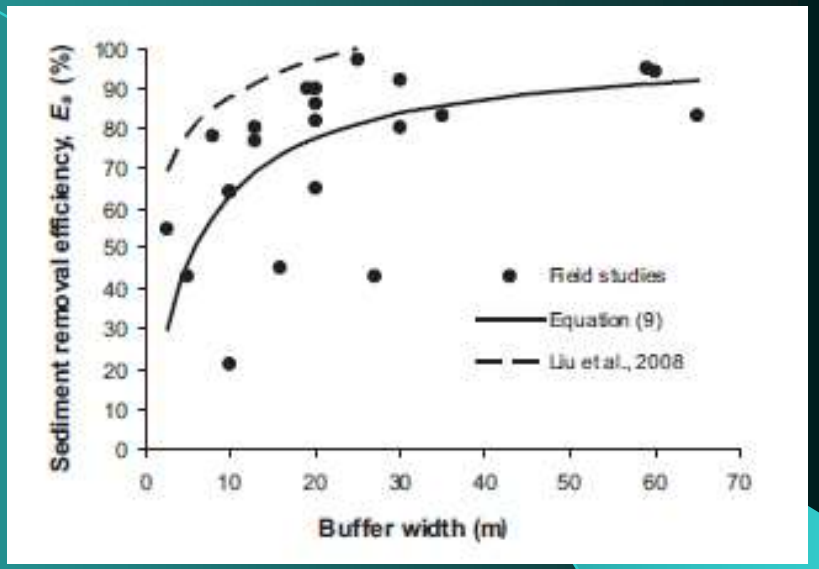
Sweeney & Newbold, JAWRA June 2014

5) Sediment Trapping

- Impervious surfaces act as direct conduits for sediments & toxicants
- Vegetated buffers act as physical traps for sediment and associated toxicants
- Vegetated buffers stabilize and degrade chemical reactants through metabolic transport, volatilization, and respiration

5) Sediment Trapping

- 65% of sediments removed by 10 m buffers
- >85% of sediments removed by 30 m buffers
- Slopes > 15% lowered efficiency 20 – 25%



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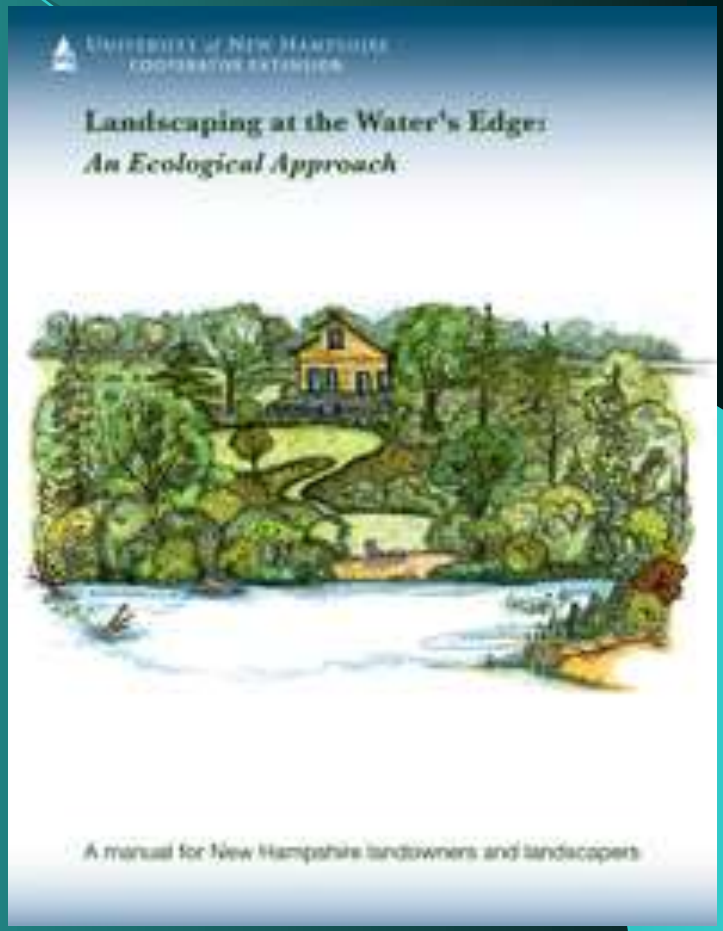
5) Sediment Trapping



8) Streambank/Shoreline Stabilization

- Vegetated buffers provide physical barriers to scouring ice
- Woody plant roots mitigate stormwater erosion
- Organic material minimizes frost cleavage
- Stabilized banks prevent siltation & turbidity

8) Streambank/Shoreline Stabilization

- Streambank width significantly wider with forested buffers > 25 m
- Streambank meander & erosion much greater with non-forest buffers
- Streambank stability dependent on intact root systems & pool-riffle variability created by coarse woody material

Sweeney & Newbold, JAWRA June 2014

What Timber Harvesting Restrictions Apply to Wetland and Riparian Buffers?

- 1991, 2006, 2011 Shoreland Protection Acts (as amended)
  - Applies only to 4th order streams, great ponds, and rivers in the Rivers Management Program
  - 250-foot shoreland protection zone
  - 50-foot natural vegetation "Waterfront Buffer"
  - >25% must remain intact in 50-150-ft "Natural Woodland Buffer"
- State Forestry Rules
  - Within a 12-month period, >50% of the basal area must be left along every wetland, water course, water body or road
    - Within 50-foot for wetlands, 3rd order and smaller streams, < 10-ac. ponds
    - Within 150 feet for 4th order + streams, great ponds, public highway
  - No slash in perennial stream channels
    - Or within 25 feet of any 4th order or higher stream or river
    - Or within 50 feet of any great pond, public highway or active railroad

What Timber Harvesting *Recommendations* Apply to Wetland and Riparian Buffers?

Aquatic System	TNC (2000) St. John River Watershed[1]	Maine Council on SFM (1996)	NH Forest Sustainability Standards (1997)	Maine Forester's Guide (1988)[3]	MDIFW's ET Forester's Guide (1999)	NH Good Forestry in the Granite State 2nd ed. (2010)
1st & 2nd-order streams	50-250 ft. (50ft. no-cut)	75 ft.[4]	100 ft.		75-100 ft. (25 ft. no-cut)	100 ft. (25 ft. no-cut)
3rd-order streams	100-500 ft. (100ft. no-cut)	250 ft.	300 ft. (25 ft. no-cut)	100-330 ft.	250-330 ft. (25 ft. no-cut)	300 ft. (50 ft. no-cut)
4th-order streams	1000 ft. (no-cut)	250 ft.	600 ft. (25 ft. no-cut)	100-330 ft.	250-600 ft. (25 ft. no-cut)	300 ft. (25 ft. no-cut)
Ponds < 10 acres	125 ft. (no-cut)		100 ft.		75-100 ft. (25 ft. no-cut)	100 ft.
Ponds > 10 acres	250 ft. (no-cut)		300 ft. (25 ft. no-cut)	100-330 ft.	250-300 ft. (75 ft. no-cut)	300 ft. (25 ft. no-cut)
Permanent Wetlands	50-125 ft. (no-cut)		100-300 ft. (0-25 ft. no-cut)		75-330 ft. (25 ft. no-cut)	50-300 ft.
High Value Vernal Pools	50-125 ft. (no-cut)		200 ft. (50 ft. low-cut)		400ft (100 ft. low-cut)	200ft

[1] No-cut zones are expanded up to 250 ft. in areas where wind-throw hazards, saturated soils, or steep slopes make soil compaction or scarification possible. Additional riparian protection is provided by inclusion of "expansion areas" (300-600-acre blocks designed to support forest interior birds and several pine marten ranges) spaced at ~1-2 mile intervals along stream corridors.

[2] Guidelines were developed by Champion International Corp. whose lands are now managed by International Paper and others.

[3] 100 ft. is recommended for watercourses draining <50 mi2 and 330 ft. is recommended for watercourses draining >50 mi2.

[4] Recommend no clearcutting within 250 ft.

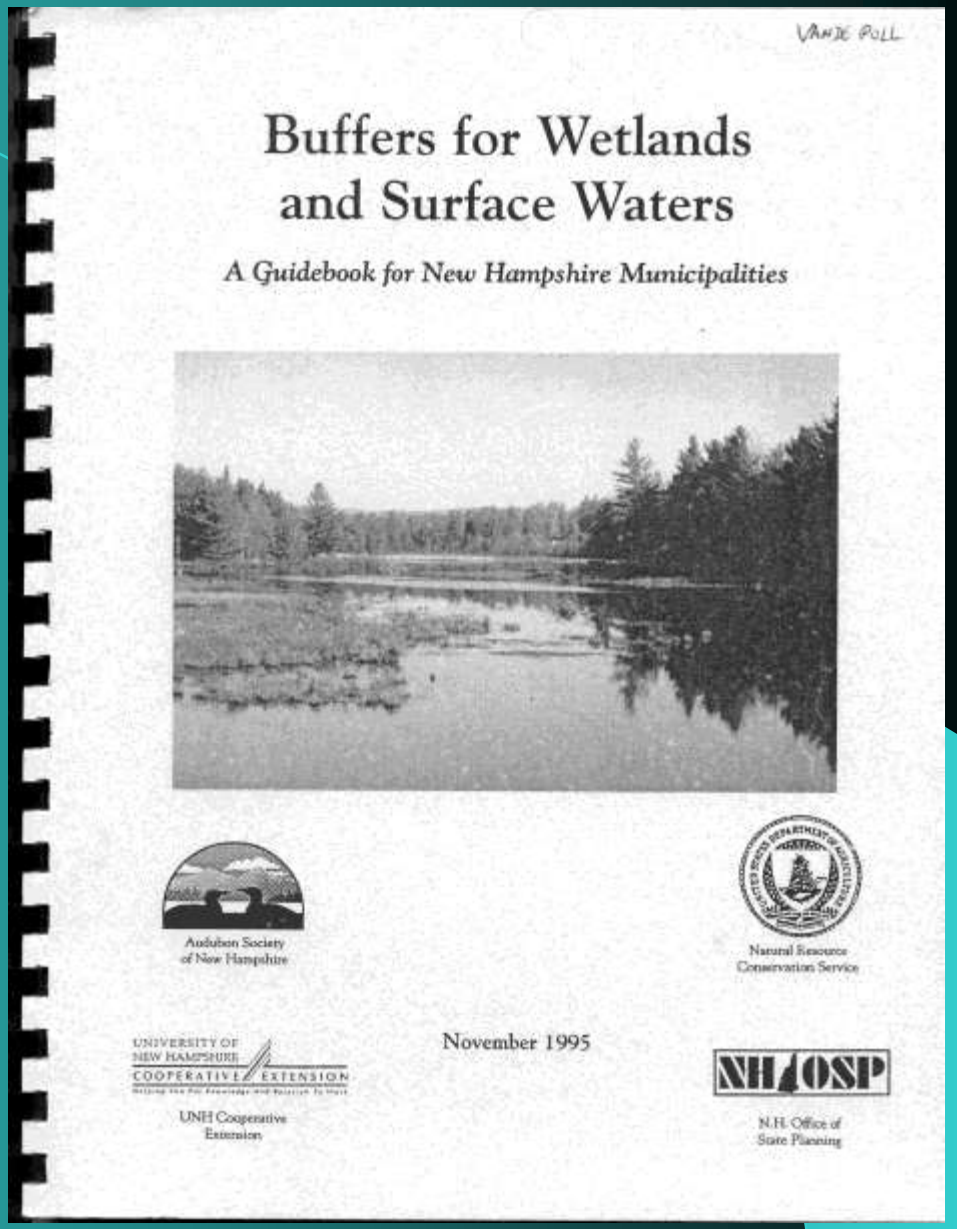
What happens when the rules get broken?

"It is difficult to imagine how the Legislature could be more clear than the 2011 amendment to RSA 674:1 VI. The statute explicitly removes any authority from the Planning Board to regulate timber harvesting, unless that activity is part of a subdivision application or project development subject to site plan review."

Are Buffer Area Restrictions Working?

- > 40% loss of wetlands in NH and their immediate buffer areas since colonial times
- Greatest loss due to agricultural conversion of floodplains
- Roughly half of NH's towns have wetland buffer restrictions
- Width of local and state buffers insufficient for most wetland-dependent wildlife

Is 100 Feet (30 m) a sufficient *standard?*



Some Additional Considerations
(From *Good Forestry in the Granite State*)

- Wetland permits (RSA 482-A) or other legal requirements (RSA 227-J) may apply to forestry operations in riparian areas (4.2 Wetlands). Timber harvesting is exempt from RSA 483-B, the Comprehensive Shoreland Protection Act, so long as it isn't associated with shoreland development or land conversion and is conducted in compliance with RSA 227-J:9.
- Landowner objectives, water-body size, landscape context, vegetative composition, slope, and other factors helps determine the appropriate width and management of RMZs.
- There are benefits to managing riparian areas with a long-term perspective (>100 years). Some potential effects of harvesting in riparian areas may be short-lived; others (e.g., reduced input of large woody material) are much longer lasting. Trees retained today become the source of key terrestrial and instream habitat structure many decades into the future.
- No harvest zones within an RMZ provide optimal water quality benefits, protect sensitive riparian natural communities and wildlife movement corridors, promote quantities of large woody material, and avoid soil disturbance.
- Active forest management can be compatible with maintaining riparian functions and values. Trees regenerated today will provide the future source of cover, cavity trees, woody material, and snags. Some silvicultural and wildlife habitat objectives can conflict with no-harvest or limited harvest RMZs. For example, maintaining beavers at an active flowage within a particular stream reach may require active tree harvesting within these zones (6.8 Beaver-Created Openings). Soil scarification improves the likelihood of regenerating white pine, red oak, or red spruce, and may conflict with the recommendation to minimize ground disturbance.

Keep in mind…

Vegetated Wetland Buffers are Essential for the Intact Functioning of all Hydrologic Systems