
Cattle Grazing & the Declines of Amphibians
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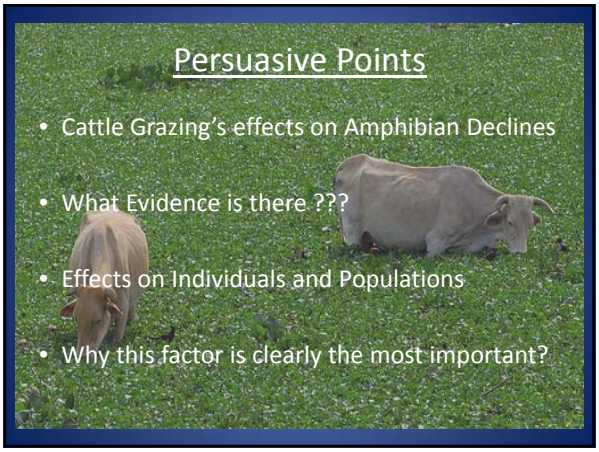
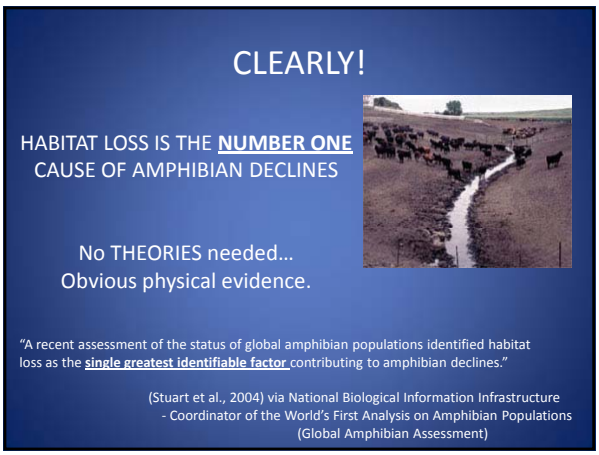
Amphibian Ecology and Conservation


Persuasive Points
• Cattle Grazing's effects on Amphibian Declines
• What Evidence is there ???
• Effects on Individuals and Populations
• Why this factor is clearly the most important?


CLEARLY!
HABITAT LOSS IS THE NUMBER ONE CAUSE OF AMPHIBIAN DECLINES
No THEORIES needed…
Obvious physical evidence.
"A recent assessment of the status of global amphibian populations identified habitat loss as the single greatest identifiable factor contributing to amphibian declines."
(Stuart et al., 2004) via National Biological Information Infrastructure
- Coordinator of the World's First Analysis on Amphibian Populations
(Global Amphibian Assessment)

Cattle & Amphibian Interface

- 1.1 million beef cattle farms in United States
  - 2 million total farms in US
  - Roughly 1 farm (450 acres) for every 275 Americans
- 97 million head of cattle in United States
  - Roughly 1 cow for every 3 Americans

PROBLEM???

Conflict occurs when farms contain farm ponds, wetlands or a natural occurring water source.

(USDA, 2007)

Cattle cause direct damage by…

- Foraging and Trampling
  - Succession next slide

- Deposition of nitrogenous waste (12x/day@~51 lbs= 355/wk)
  - Immediate populations and downstream populations
- Destroying egg masses/ direct adult mortality

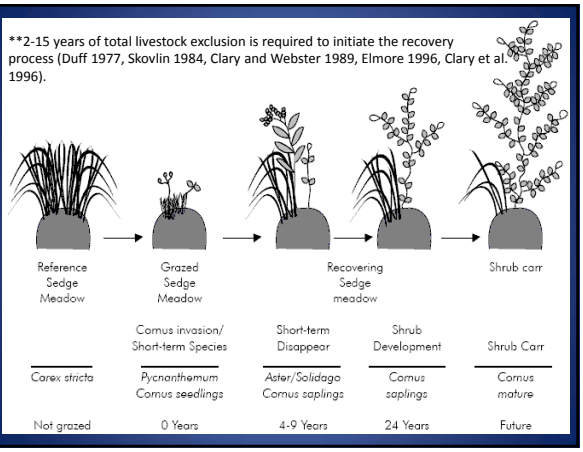
(Schmutzer et al.)

Compounding Problem

- Not only are cattle destroying habitat (1st slide)
  - Destroying food source
  - Destroying adult breeding grounds & cover from prey
  - Destroying young & egg masses
- Effectively, there is no way a population can sustain life with cattle present in watershed
  - Exception- Rana catesbeiana (habitat generalist)

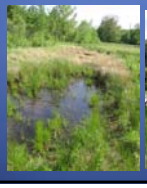
Schmutzer et al. 2007

**2-15 years of total livestock exclusion is required to initiate the recovery process (Duff 1977, Skovlin 1984, Clary and Webster 1989, Elmore 1996, Clary et al. 1996).



Quotes on Grazing

- In some cases grazing may be even more damaging in wetter than in drier environments because moist soils are more vulnerable to compaction and disturbance than dry soils (Marlow and Pogacnik 1985, Trimble and Mendel 1995, McInnis 1996).


Loss by Category

- Conversion of wetland/forest to agriculture
- Presence of cattle over long periods of time
- Nitrogenous deposits (immediate/downstream)
  - Ammonia, nitrite, nitrate
    - Decrease survival of embryos & larvae
    - Negatvely affect body size & increase malformation rates
    - Increased nitrogen= decreased DO =EUTROPHICATION
- Damage to vegetation (habitat/eggs/cover)
  - (previous slide)
- Open (no cover)---increased temp.

(Schmutzer 2007)

Quantifying the Problem

In a 2008 report, Schmutzer, Gray, Burton, & Miller found that

- **Mean species richness of larvae was 2.7x greater in wetlands without cattle**
- **Mean species diversity was 2-4x great in wetlands without cattle**

In the same study, Schmutzer, Gray, Burton, & Miller found that

- **Body Length & total length of Pseudacris crucifer were 13.4% & 18.5% greater in non-accessed wetlands respectively.**

(Schmutzer et. al. 2008)

More Numbers…

In the same 2008 report, Schmutzer, Gray, Burton and Miller found

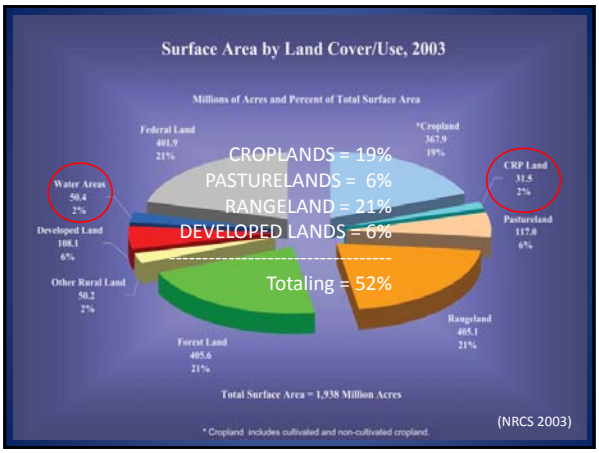
- Biomass of detritus was 10.9% greater in non-accessed wetlands (habitat/eggs/cover/food)

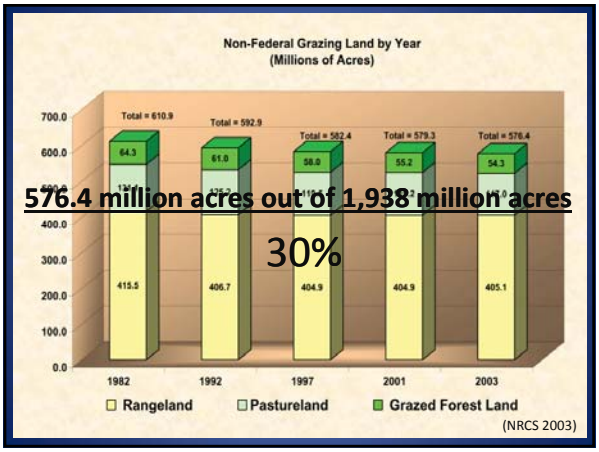
Non-accessed vs. accessed wetlands detrital biomass

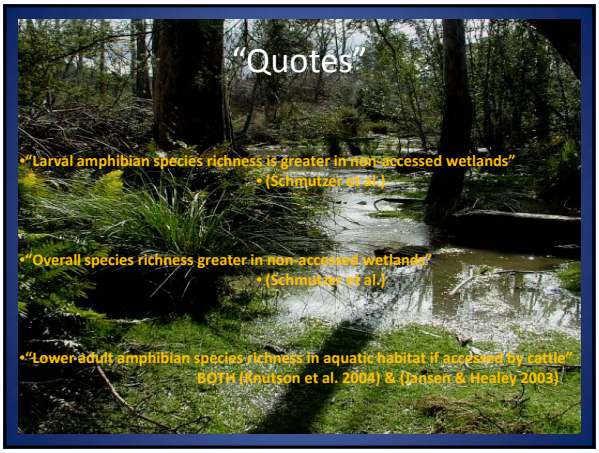
- May = 21.8x higher
- July = 5.3x higher
- August = 9.9x higher

Schmutzer et. al. 2008

Cattle and wetlands need to be protected from each other

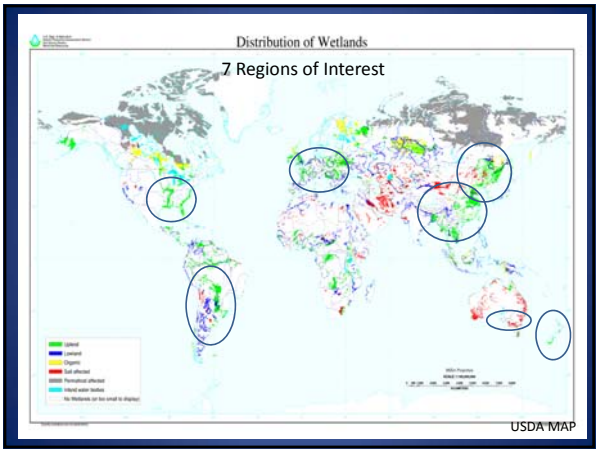

Surface Area by Land Cover/Use, 2003
Millions of Acres and Percent of Total Surface Area
Federal Land 401.9 21%
*Cropland 367.9 19%
CRP Land 31.5 2%
Water Areas 50.4 2%
Pastureland 117.0 6%
Developed Land 108.1 6%
Other Rural Land 50.2 2%
Rangeland 405.1 21%
Forest Land 405.6 21%
CROPLANDS = 19%
PASTURELANDS = 6%
RANGELAND = 21%
DEVELOPED LANDS = 6%
Totaling = 52%
Total Surface Area = 1,938 Million Acres
* Cropland includes cultivated and non-cultivated cropland.
(NRCS 2003)

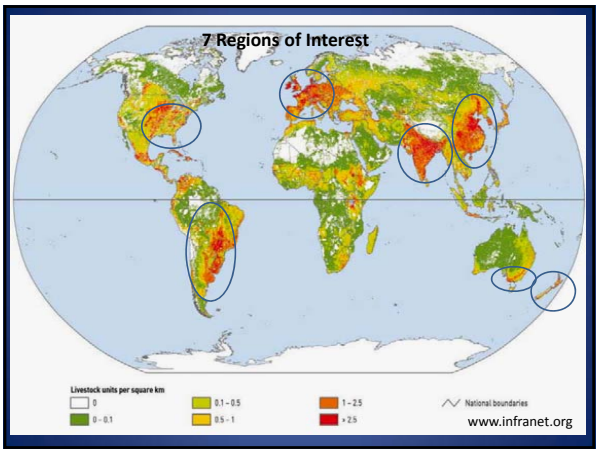

Non-Federal Grazing Land by Year
(Millions of Acres)
700.0
600.0
400.0
300.0
200.0
100.0
0.0
Total = 610.9
Total = 592.9
Total = 582.4
Total = 579.3
Total = 576.4
64.3
61.0
58.0
55.2
54.3
415.5
406.7
404.9
404.9
405.1
1982
1992
1997
2001
2003
Rangeland
Pastureland
Grazed Forest Land
576.4 million acres out of 1,938 million acres
30%
(NRCS 2003)

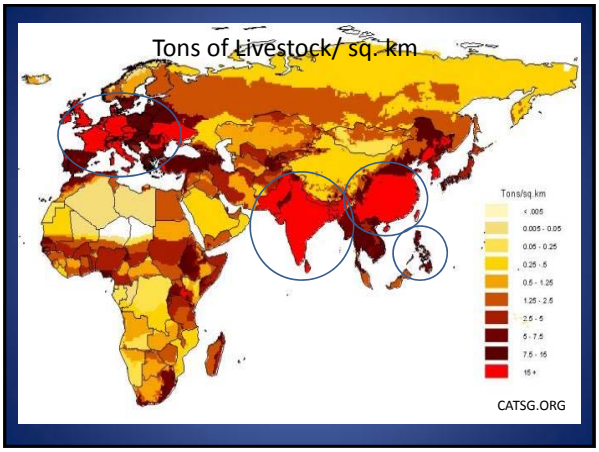

"Quotes"
•"Larval amphibian species richness is greater in non-accessed wetlands"
• (Schmutzer et al.)
•"Overall species richness greater in non-accessed wetlands"
• (Schmutzer et al.)
•"Lower adult amphibian species richness in aquatic habitat if accessed by cattle"
BOTH (Knutson et al. 2004) & (Jansen & Healey 2003)

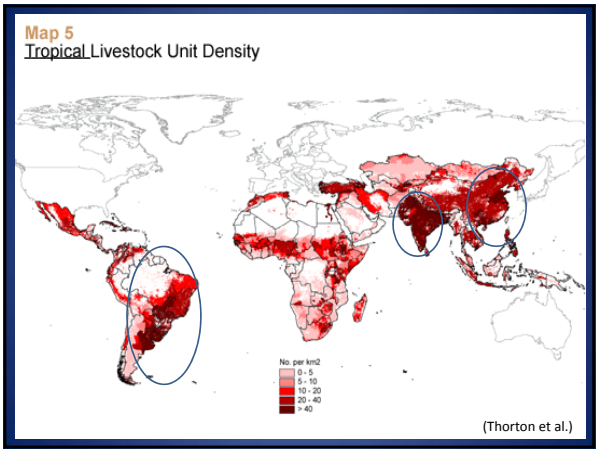
Why is THIS the biggest cause of Amphibian declines?

- Roughly 107.7 million acres of wetlands (USFWS 2004)
- Location of wetlands within watersheds?
- Location of farms within watersheds?
- LOCATION, LOCATION, LOCATION!!!




7 Regions of Interest
Livestock units per square km
0
0 - 0.1
0.1 - 0.5
0.5 - 1
1 - 2.5
> 2.5
National boundaries
www.infranet.org


Tons of Livestock/ sq. km
Tons/sq.km
< .005
0.005 - 0.05
0.05 - 0.25
0.25 - .5
0.5 - 1.25
1.25 - 2.5
2.5 - 5
5 - 7.5
7.5 - 15
15 +
CATSG.ORG


Map 5
Tropical Livestock Unit Density
No. per km2
0 - 5
5 - 10
10 - 20
20 - 40
> 40
(Thorton et al.)

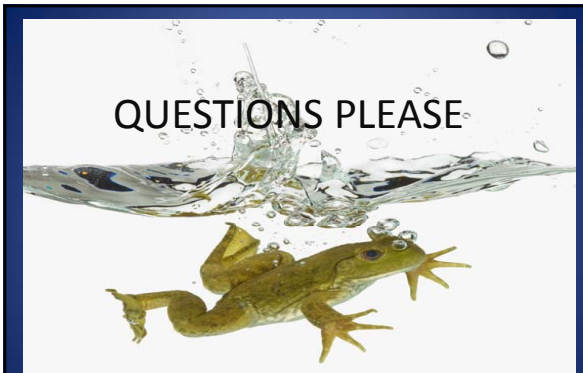
Concluding…

"The conclusion that all grazing (Page 12, Belsky, Matzke, Uselman)practices detrimentally affect wetland areas (Elmore and Kauffman (1994) is to be **expected** since traditional grazing systems were developed for protecting upland grasses, not for protecting riparian plants and streamsbanks" (Platts 1991, Saab et al. 1995).

The Sky is Falling !!!

- What can we do???
- (In regards to cattle grazing)…damage can be reduced by (A) improving grazing methods, (B)herding or fencing cattle away from streams, (C)reducing livestock numbers, or (D) increasing the period of rest from grazing
- (Armour et al. 1994, Elmore and Kauffman 1994).

QUESTIONS PLEASE



HANDOUT

Sources

- Armour, C., D. Duff, and W. Elmore. 1994. The effects of livestock grazing on western riparian and stream ecosystem. Fisheries 19(9):9-12.
- Belsky A.J., Matzke A. & Uselman S. (1999) Survey of livestock influences in stream and riparian ecosystems in the western United States. Journal of Soil and Water Coverservation, 54, 419-431.
- Clary, W.P., N.L. Shaw, J.G. Dudley, V.A. Saab, J.W. Kinney, and L.C. Smithman. 1996.Response of a depleted sagebrush steppe riparian system to grazing control and woody plantings. USDA Forest Serv. Res.Pap. INT-RP-492.
- Clary, W.P., and B.F. Webster. 1989. Managing grazing of riparian areas in the intermountain region. USDA Forest Serv. Gen. Tech. Rep. INT-263.
- Duff, D.A. 1977. Livestock grazing impacts on aquatic habitat in Big Creek, Utah. p. 129-142. In: Proc. of the workshop on wildlife-fisheries relationships in the Great Basin.
  Univ. California, Agric. Station, Sci. Spec. Publ. 3301, Berkeley, CA.

Sources

- Elmore, W. 1996. Riparian areas: perceptions in management. USDA Forest Serv., Pacific Northwest Research Station, Natural Resource News 6(3):9.
- Elmore, W., and B. Kauffman. 1994. Riparian and watershed systems: degradation and restoration. p. 212-231. In: M. Vavra, W.A. Laycock, and R.D. Pieper (eds.),Ecological implications of livestock herbivory in the West. Soc. Range Management,Denver, CO.
- Jansen A. & Healey M. (2003) Frog communities and wetland condition: relationships with grazing and domestic livestock along and Australian floodplain river. Biological Conservation, 109, 207-219.
- Knutson M.G., Richardson W.B., Reineke D.M. Gray B.R., Parmelee J.R. & Weick S.E. (2004) Agricultural ponds support amphibian populations. Ecological Application, 14, 669-684

Sources

- Gray, Matthew, Miller, Debra. and Baldwin, Charles. "RANAVIRUS PREVALENCE IN AMERICAN BULLFROGS INHABITING PONDS WITH CATTLE ACCESS" Paper presented at the annual meeting of the International Congress for Conservation Biology, Convention Center, Chattanooga, TN, Jul 10, 2008 <Not Available>. 2009-03-04<http://www.allacademic.com/meta/p241560_index.html>
- Marlow, C.B., and T.M. Pogacnik. 1985. Time of grazing and cattle-induced damage to streambanks. In: R.R. Johnson, C.D. Ziebell, D.R. Patton, and others (tech. coords.), Riparian ecosystems and their management: reconciling conflicting uses.USDA Forest Serv. Gen. Tech. Rep. RM-120.
- McInnis, M.L. 1996. Principles of successful livestock grazing in riparian ecosystems. USDA Forest Serv., Pacific Northwest Research Station, Nat. Res. News 6(3):1.
- Platts, W.S. 1991. Livestock grazing. p. 389-424. In: W.R. Meehan (ed.), Influences of forest and rangeland management on salmonid fishes and their habitats. Amer. Fisheries Soc. Sp. Publ. 19:389-423.

Sources

- Saab, V.A., C.E. Bock, T.D. Rich, and D.S. Dobkin. 1995. Livestock grazing effects in western North America. p. 311-353. In: T.E. Martin, D.M. Finch (eds.), EcologyPage 21, Belsky, Matzke, Uselman and management of neotropical migratory birds: a synthesis and review of critical issues. Oxford University Press, London.
- Schmutzer, A.C. 2007. Influences of cattle on larval amphibians and the aquatic environment in the Cumberland Plateau wetlands. Thesis, University of Tennessee, Knoxville, USA.
- Schmutzer, A.C., M. J. Gray, E.C. Burton, and D.L. Miller. 2008. Impacts of cattle on amphibian larvae and the aquatic environment. Freshwater Biology 53:2613-2625.
- Skovlin, J.M. 1984. Impacts of grazing on wetlands and riparian habitat: a review of our knowledge. p. 1001-1103. In: Developing strategies for range management. Westview Press, Boulder,CO.
- Stuart S.N., Chanson J.S., Cox N.A., Young B.E., Rodrigues A.S.L., Fischman D.L. & Waller R.W. (2004) Status and trends of amphibian declines and extinctions worldwide. Science, 306, 1783-1785.
- Thorton P.K., Kruska R.L., Henninger N., Krisjanson P.M., Reid R.S., Atieno F., Odero A.N. and Ndegwa T. 2002. *Mapping Poverty and Livestock in the Developing World.* ILRI (International Livestock Research Institute), Nairobi, Kenya. 124pp.
- Trimble, S.W., and A.C. Mendel. 1995. The cow as a geomorphic agent -- a critical review. Geomorphology 13:233-253.

Source Websites

- http://soils.usda.gov/use/worldsoils/mapindex/wetlands.html.
- www.USFWS.gov
- http://www.catsg.org/cheetah/07_map-centre/7_1_entire-range/thematic-maps/total_livestock_biomass_density_1994.jpg
- http://www.ers.usda.gov/StateFacts/US.htm, national data. Economic Research Service, USDA, Washington, D.C. website 2007. Accessed March 29,2009
- "Grassland Biomes: Cattle and the American Prairie"-Video" HowStuffWorks.comhttp://videos.howstuffworks.com/hsw/8620-grassland-biomes-cattle-and-the-american-prairie-video.htm. Accessed March 30, 2009.