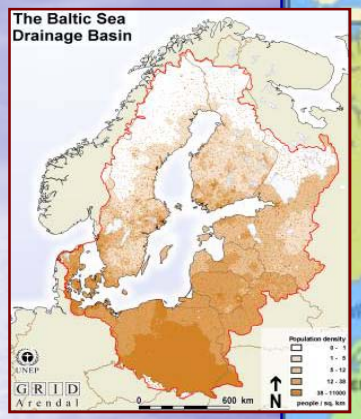
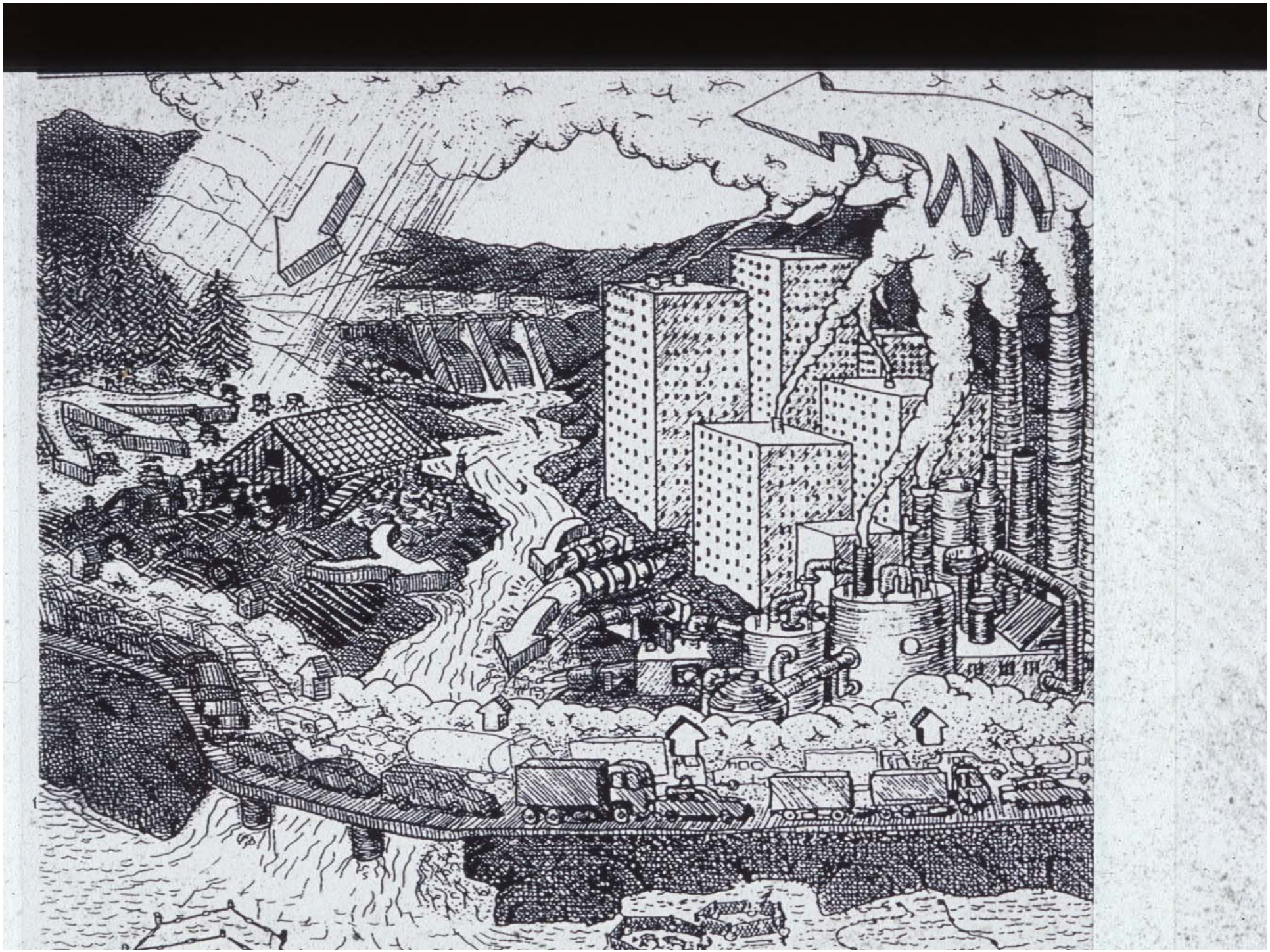

UPPSALA UNIVERSITET
PARTNERSHIPS for SUSTAINABLE DEVELOPMENT
EHSA
Ecosystem Health & Sustainable Agriculture Project
The Baltic University
A Regional University Network
Partnership Fair, UN CSD 16 Meeting
May 6th , 2008
Christine Jakobsson, BUP, Uppsala University, Val Beasley & Thomas Gillespie, University of Illinois, Leif Norrgren, Swedish University of Agricultural Sciences
Envirovet Baltic
BALTIC 21

EHSA



Baltic Sea- Similar Characteristics to US Great Lakes

- Limited water turnover
- Cold water, ice cover
- High human densities in portions of drainage
- Heavy industry and agriculture
- History of poorly treated waste, waste dumping
- Multiple jurisdictions

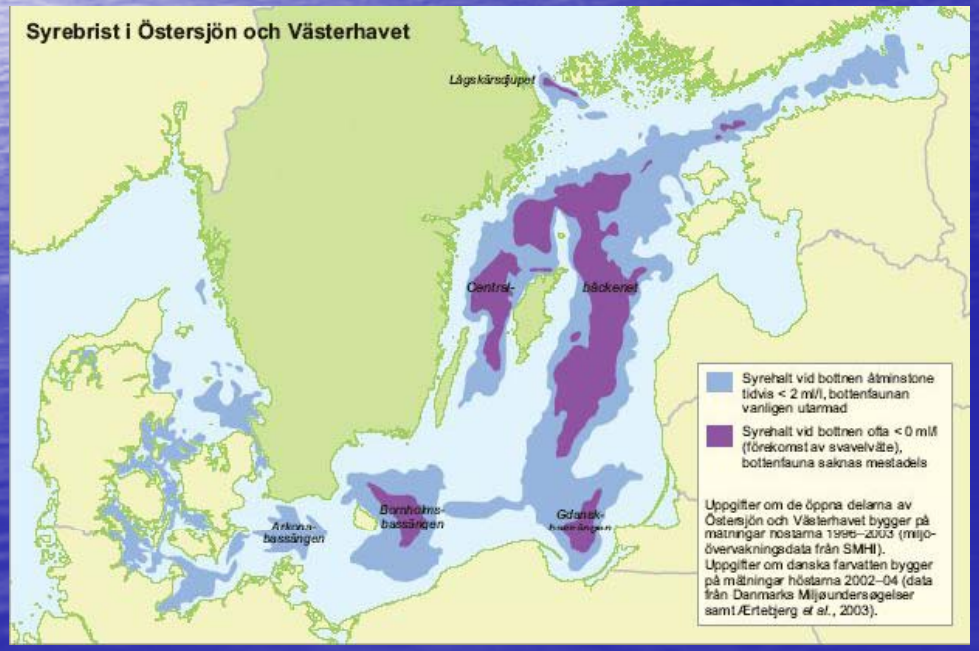


The Baltic Sea & eutrophication

- N or P?
- Coastal areas
- Nitrogen fixation in the sea
- P in organic material e.g. manure, plant material, is very reactive
- Algal blooms
- Waste water treatment plants
- Agriculture

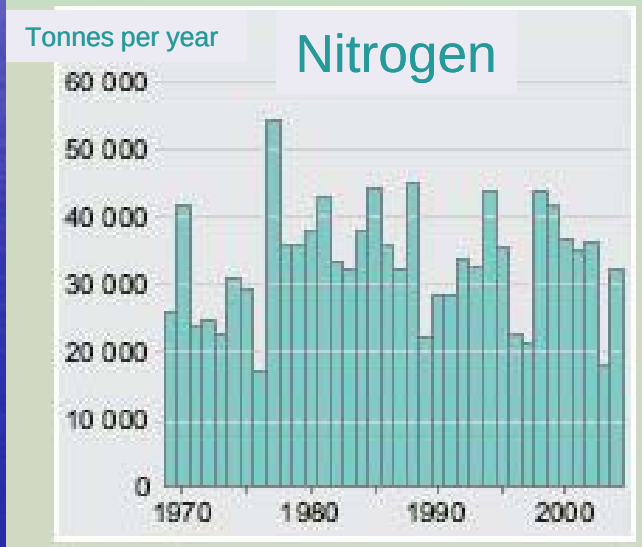
Eutrophication - the state of the Baltic Sea

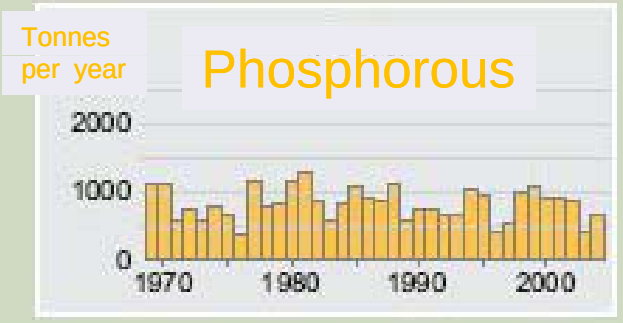
- 780 000 t N & 36 000 t P enter the Baltic Sea & the Western Sea *per* year
- 1/3 of the sea beds of the Baltic Sea are anoxic
- The secchi depth has been reduced by 4 m during the last 50 years



(Monitor 19, The Swedish EPA, 2005; www.naturvardsverket.se)

To the Baltic proper and Öresund





Definition of the ecosystem approach

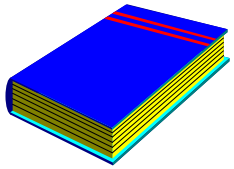
- Ecosystems consist of: flora, fauna, other organisms, the surrounding environment.
- Are all a part of a food web, with interconnections where the different levels influence each other as the result of complex & dynamic relationships.
- If a critical species decreases in number or disappears, these relationships can break down. The ecosystem can then take on a completely different state after the break down.
- Sustainable management must be based on this perspective & consider the impact of proposed measures in a holistic manner.
- The ecosystem approach places more far-reaching demands on protection measures.
- Management: - more adaptive & instructive with clear links between implemented measures, environmental monitoring & research;
  - based more on the obligations of the sectors & less on their rights.
- The aim is to preserve the structure & function of ecosystems & hence maintain their capacity to provide us with goods & services.

Goals for sustainable agriculture

Agriculture contributes significantly to the society of the future. Sustainable agriculture is the production of high quality food and other agricultural products / services in the long run with consideration taken to economy and social structure, in such a way that the resource base of non-renewable and renewable resources is maintained. Important sub-goals are:

1. *the farmers income should be sufficient to provide a fair standard of living in the agricultural community*
2. *the farmers should practise production methods which do not threaten human or animal health or degrade the environment including biodiversity and at the same time minimise the environmental responsibilities that future generations must assume*
3. *non-renewable resources have to gradually be replaced by renewable resources and that recirculation of non-renewable resources is maximised*
4. *sustainable agriculture will meet societies needs of food and recreation and preserve the landscape, cultural values and the historical heritage of rural areas and contribute to create stable well developed and secure rural communities*
5. *the ethical aspects of agricultural production are secured*

The Baltic 21 Agriculture Sector priority actions:



• Education and training

- Create demonstration watersheds with demonstration farms in a network in the different countries (part of joint action 3)
- Develop a ”Virtual Research Institute” for sustainable agriculture based on the already existing NOVABOVA in the Baltic Sea Region.
- Elaborate and implement agro-environmental legislation and policies

www.baltic21.org

EHSA

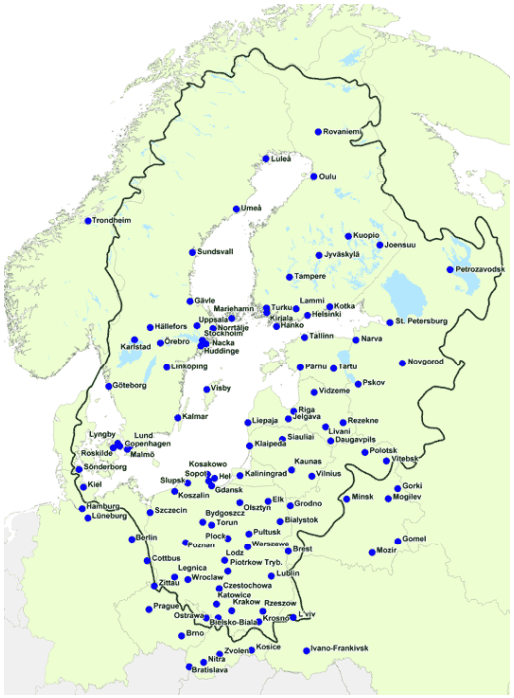
Envirovet Baltic

New Course Package !!

Ecosystem Health & Sustainable Agriculture

- **New course package on SD & agriculture & ecosystem health** for university level
- Developed in cooperation with the ***Baltic University Programme*** & the ***Envirovet Baltic*** network

The Baltic University Programme



- a network of 220 universities & institutes of higher learning;
- 14 countries in the Baltic Sea Basin
- 14 regional centres
- 1.500 teachers/researchers contributed
- 9.500 students yearly
- coordinated by a Secretariat at Uppsala University, Sweden;
- focuses on **sustainable development, environmental protection & democracy**;

The Baltic University Programme

Activity areas

- education
- research
- information
- outreach activities & applied projects

The Baltic University Programme

Courses

1. Basic, undergraduate courses
2. Specialisation, master courses
3. Competence development for professionals

- *interdisciplinary*
- *based on research*
- *English language*
- *problem oriented*
- *interactive*
- *international diploma*

Envirovet Baltic

- Network of environmental health scientists / educators from USA & 9 countries bordering Baltic Sea

- Founded in 2001
  - College of Veterinary Medicine, U of Illinois
  - Centre for Reproductive Biology, Uppsala
  - University scientists in Baltic Sea Region

Envirovet Baltic

- The major objective is education in the field of environmental health to veterinarians, agricultural and animal scientists, other health professionals and environmentally-oriented scientists.

Envirovet Baltic

Present Activities

- EHSA project
- New Baltic Network for Wildlife and Fish Health established in Tallinn, November 2007 (coordinated from National Veterinary Institute and Swedish Univ. of Agricultural Sciences)
- Involvement in several future programs for surveillance of ecosystem health, transmission of infectious diseases and adverse effects of pollutants

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Envirovet Baltic

New Course Package !!

Ecosystem Health & Sustainable Agriculture

- Countries: Belarus, Canada, Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Kaliningrad & St. Petersburg in Russia, Slovakia, Sweden, Ukraine & USA
- Part of HELCOM and GEF's Baltic Sea Regional Project in NW Russia (Sida financed)
- Baltic 21 Lighthouse project
- 8 seminars in Russia in 2007-2008
- 1 seminar in Estonia, Lithuania, Latvia, Poland

EHSA Partners

- Baltic University Programme Network
- Envirovet Baltic Network

Major Groups:

- Uppsala University (Sweden)
- Swedish University of Agricultural Sciences (SLU) (Sweden)
- Belarusian State Agrarian Technical University (Belarus)
- The Royal Veterinary and Agricultural University (KVL) (Denmark)
- Estonian University of Life Sciences (Estonia)
- Rural Economy Research Centre (Estonia)
- Tallinn Technical University (Estonia)
- University of Tartu (Estonia)
- University of Helsinki (Finland)
- TuTech Innovation GmbH, Life Sciences (Germany)
- AC Latvia (Latvia)
- Latvia University of Agriculture (Latvia)
- Klaipeda University (Lithuania)
- Lithuanian Institute of Water Management (LIWM) (Lithuania)
- Lithuanian Veterinary Academy (LVA) (Lithuania)

EHSA Partners

- Warsaw Agricultural University (Poland)
- Academy of Management and Agrobusiness (Russian Federation)
- Kaliningrad Institute for Retraining of Staff in Agribusiness (Russian Federation)
- Kaliningrad State University (Russian Federation)
- St.Petersburg State Agrarian University (Russian Federation)
- Slovak Agricultural University, Department of Sustainable Development (Slovakia)
- Baltic Sea Unit, Swedish International Development Cooperation Agency (Sweden)
- National Veterinary Institute (Sweden)
- Swedish Environmental Protection Agency (Sweden)
- Swedish Institute of Agriculture and Environmental Engineering JTI (Sweden)
- WWF (Sweden)
- Ukrainian National Forestry University (Ukraine)
- University of Illinois at Urbana-Champaign (UI) (United States of America)

Other intergovernmental organizations:

- Helsinki Commission, HELCOM (Finland)
- Baltic 21 (Sweden)

Governments:

- Government of Finland - Ministry of Social Affairs and Health
- Government of Sweden - Ministry of Environment

Unique cooperation

- Agronomists,
- Veterinaries,
- Animal scientists,
- Nature geographers,
- Biologists,
- Wildlife biologists,
- Chemists
- Economists
- Rural development specialists
- Public health professionals etc.
- Gender specialist and social experts
- New concept on sustainable agriculture & its part in the rural ecosystem;
- Substantial knowledge on land use & rural development, ecosystem health & the interactions between wild & domesticated organisms, poverty alleviation, legislation, control measures, stewardship for the future.

Non-sustainable issues of present day agriculture

Production

- Contaminants and residues in food
- Unfavourable market conditions for agricultural production
- Excessive livestock density
- Changing climate, temperatures, water availability, storms

Natural resources

- Dependence on fossil energy
- Low efficiency of energy use in agricultural production
- Dependence on non-renewable phosphorus deposits
- Lack of water and of high water quality
- Nutrient losses (N and P) to the environment
- Decrease in soil fertility (acidification, carbon content, nutrient status, structure, compaction, salinisation)
- Erosion
- Pesticide residues in soil, water and non-target organisms
- Accumulation of heavy metals and nuclides
- Soil contamination with persistent organic and inorganic substances
- Loss of biodiversity and genetic resources
- Air pollution (NH_3, CH_4, N_2O, pesticides)

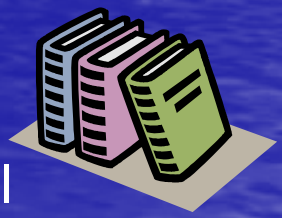
Non-sustainable issues of present day agriculture

Human and animal welfare

- Occupational threats to farmers & consumers health
- Dependence on growth promoters & antibiotics in animal production
- Unfavourable animal welfare & threats to animal health
- Diseases that can spread from animals to humans e g BSE, avian influenza

Socio-economic criteria

- Unfavourable economical profitability of farming
- Lack of food security & food production security
- Unfavourable social infra-structure in rural areas
- Lack of preservation of nature & historical values
- Urbanisation



Competence- Education

- Lack of education, information & management skill

Ecosystem Health & Sustainable Agriculture

Modules

Rural development and land use

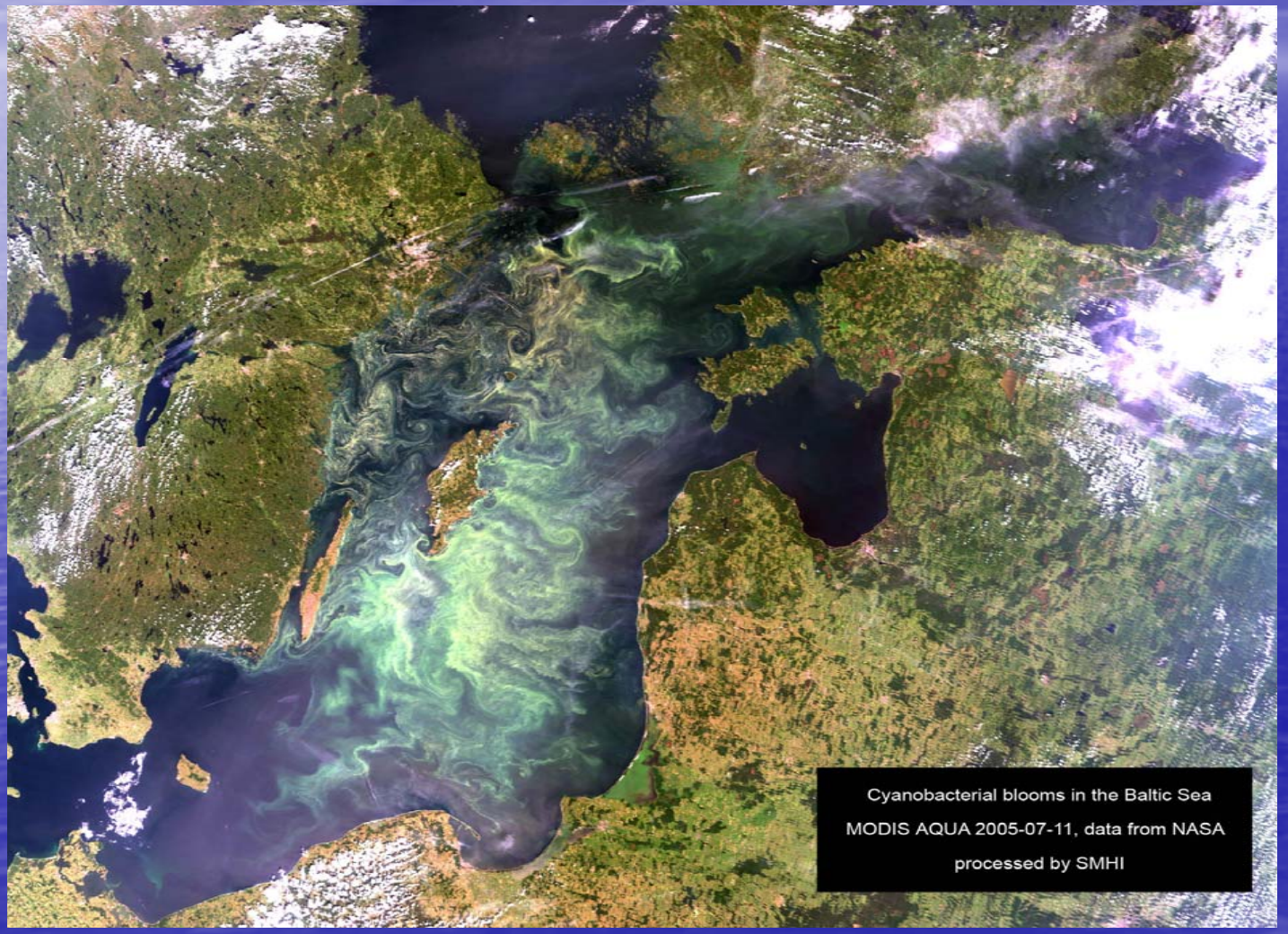
Sustainable agriculture

Ecology and animal health

3 books for university teaching

Examples from the books

Baltic Sea - phosphorus and nitrogen from agriculture land is a main part of the problem



B. Ulen, 2008

High prices - former fallows are tilled

B. Ulen, 2008


EHSA
Expected new regulations for livestock density

Within EU
Maximum allowed load by manure (Nitrate Directive)

P 25 kg ha^{-1}

N 170 kg ha^{-1}

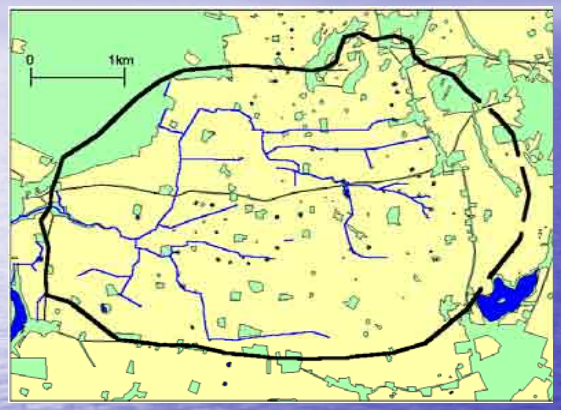
B. Ulen, 2008

Systematic advice to farmer - campaigns similar to the Swedish ”Focus on Nutrients” are expected

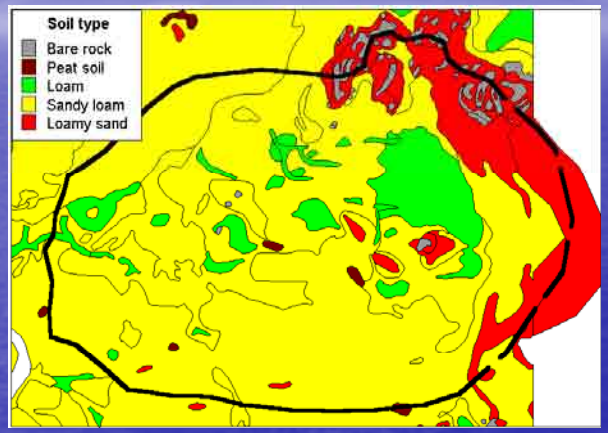
B. Ulen, 2008

Examples of factors with impact on nitrogen leaching from soil to water

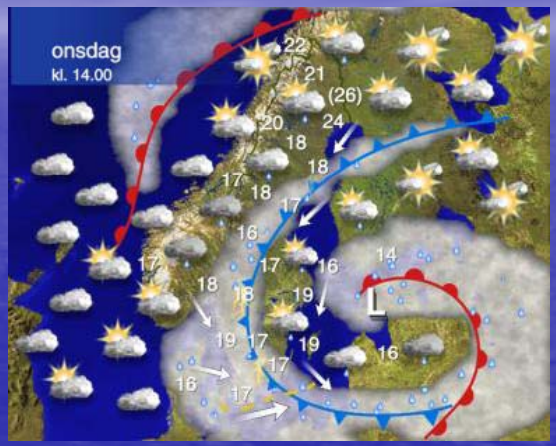
Distribution of arable land



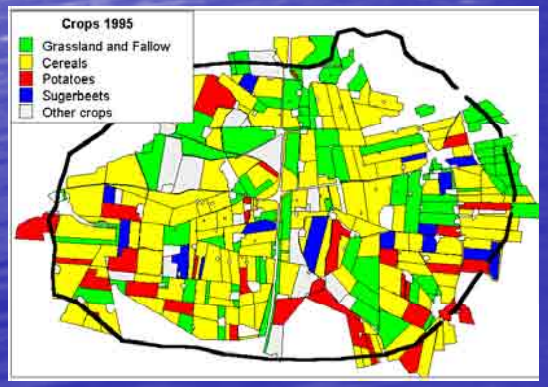
Soil type



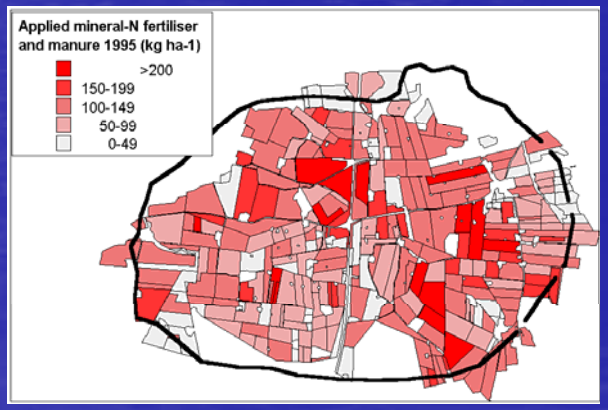
Climate



Distribution of crops



Fertilized amount



Other managements

B. Ulen, 2008

Other countermeasures for N

- Using nutrient balances & plant production plans
- Using catch crops
- Using manure as a resourse
- Fertilizing with manure in spring
- No autumn mineral fertilizing & placement of fertilizer in bands in spring


Phosphorus
90% of loss in 1 % of the time
Countermeasures shall be effective in the critical episodes
B. Ulen, 2008

General countermeasures for P

- Soil management
- Soil tillage
- Soil covering
- Limit phosphorus in soil
- Fertilizing technique
- Catching phosphorus e.g. buffer zones, biologically active wetlands, sedimentation ponds, timing fertilization relative precipitation.

Habitat degradation /destruction / fragmentation

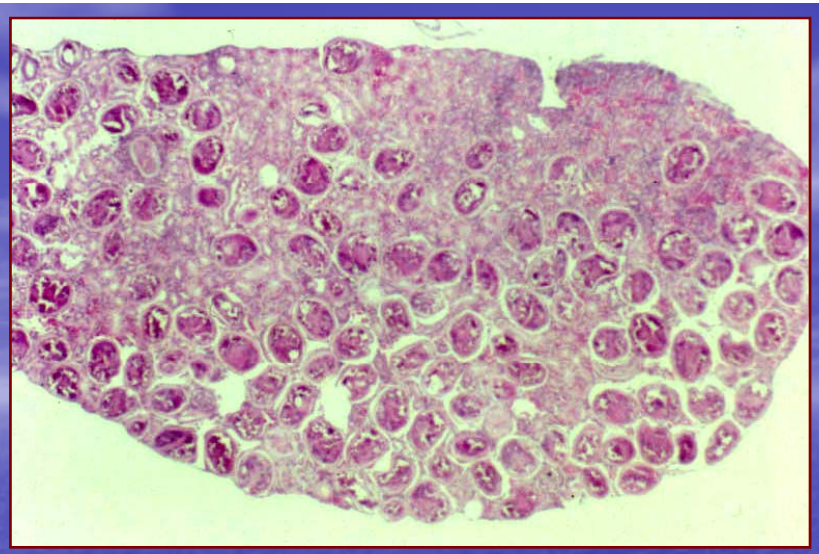
Potential Mechanisms of Amphibian Declines

Infectious Diseases

- Trematodes

Echinostoma →

Ribeiroia →



Kidney of cricket frog metamorph from Illinois with abundant *Echinostoma*

Ribeiroia sp. in tail resorption site

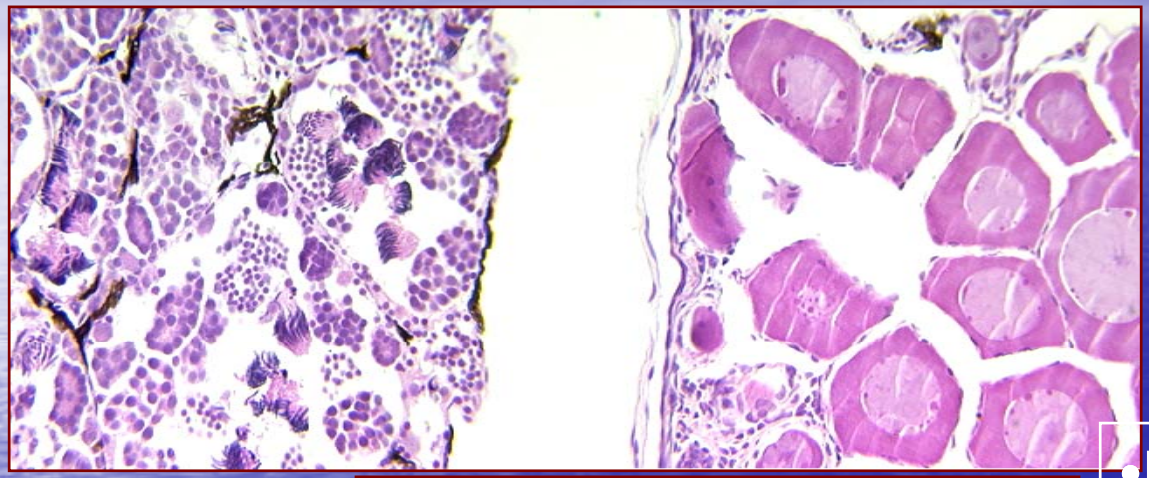
Bullfrog metamorph from Illinois with abundant *Ribeiroia*

Mechanisms of Amphibian Declines: Endocrine Disruption?

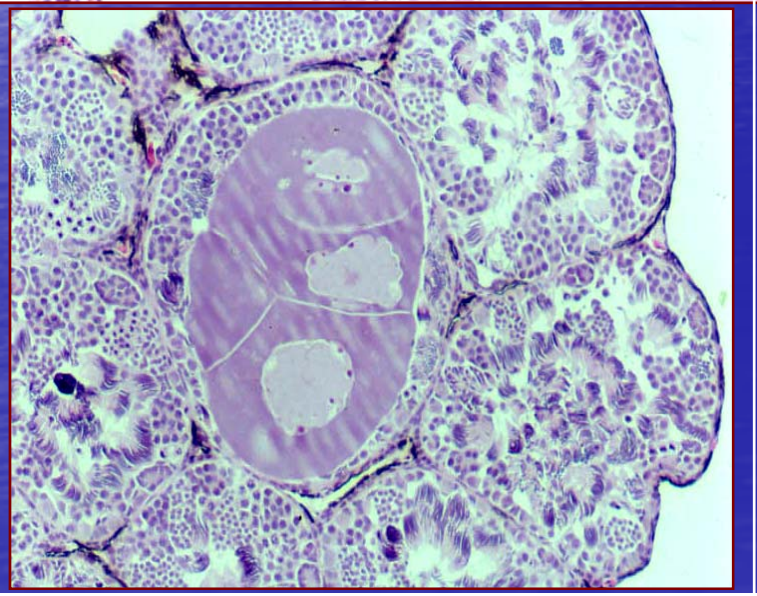
Cricket Frogs: Initial Field Collections

1994: Collected 242 frogs (May & June) from 8 sites:

- Intersex Males – 6 of 89 Adult Males (6.7%)



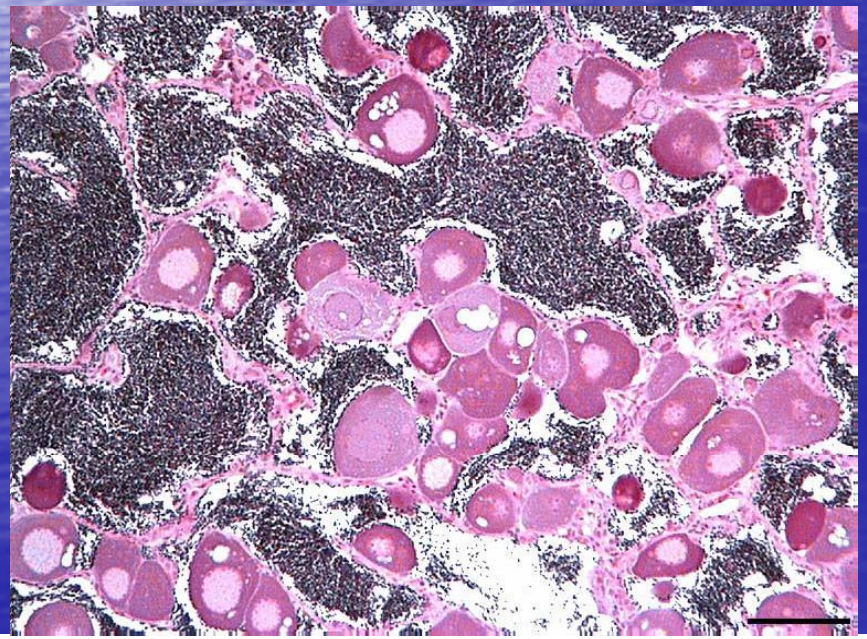
•Occasionally - normal testis (left) & small ovary (right) of a cricket frog



•Mainly – ovotestis = ova in functional testes.

• Small numbers of cricket frogs affected per site, but relatively small numbers targeted for collection.

Intersexuality in fish



- Correlated to exposure to sewage effluents
- A large number of chemicals cause the phenomena
- The consequence for populations over time???

Environmental quality criteria

Obvious risk for lethal effects for several species in the ecosystem

Risk for lethal effects for sensitive species

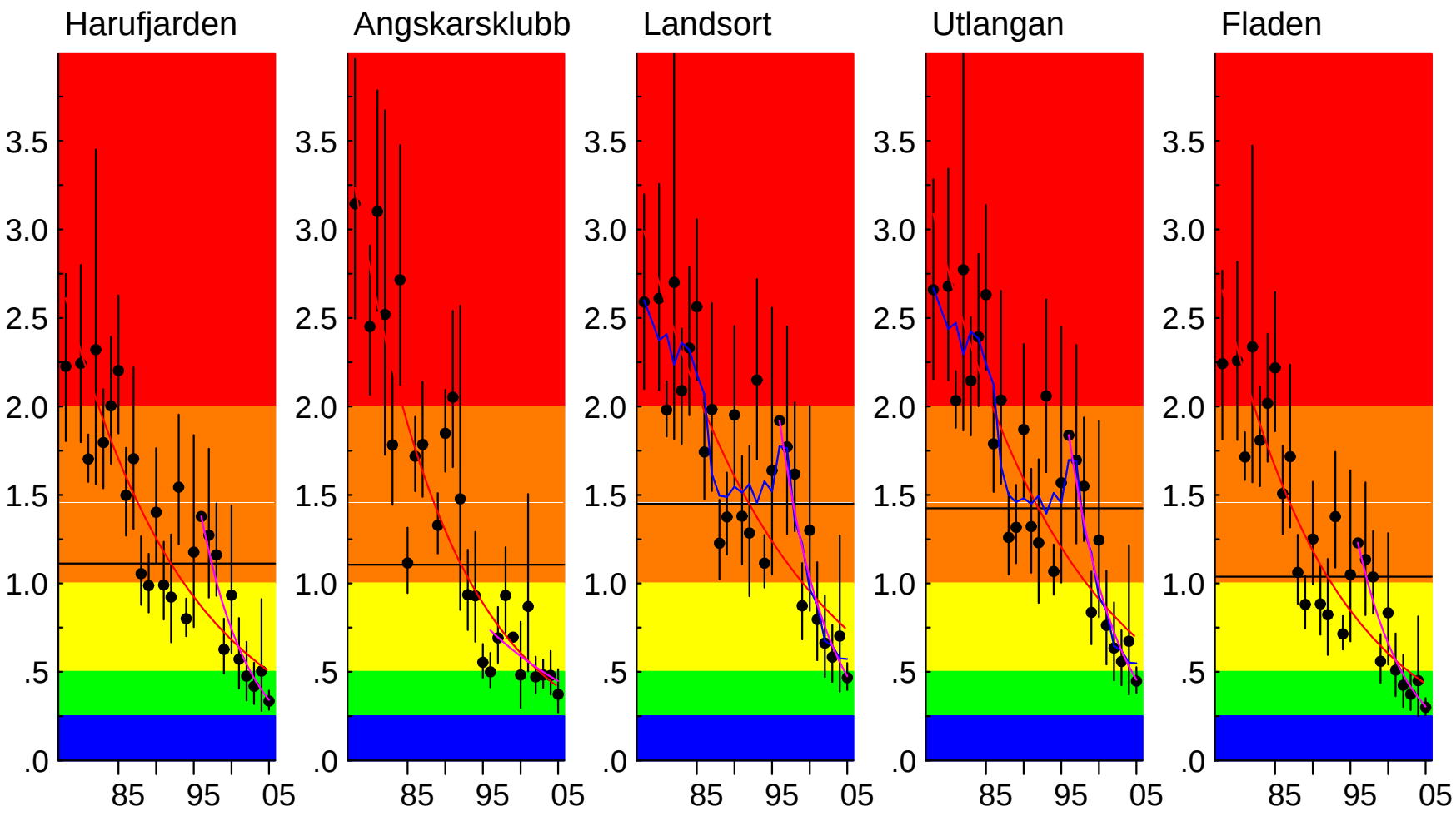
Assumed risk for sublethal effects for sensitive species, possible risk for less sensitive species

Measures should be taken

Possible risk for sensitive species at long time exposure

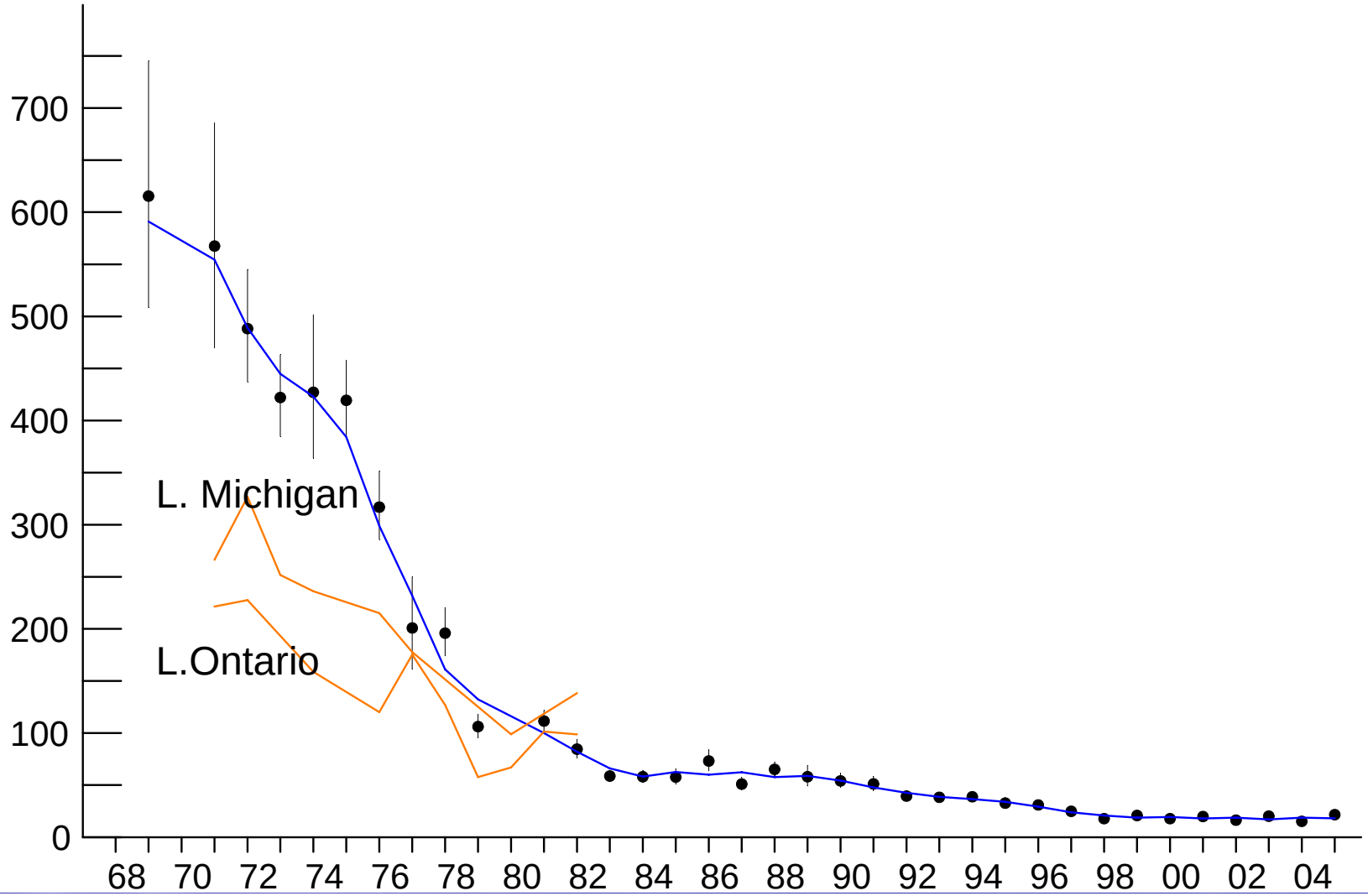
Negligible risk for sensitive species even at long time exposure

sPCB, ug/g lipid w., herring muscle



Кайра

DDE, ug/g lipid w., guillemot egg, early laid



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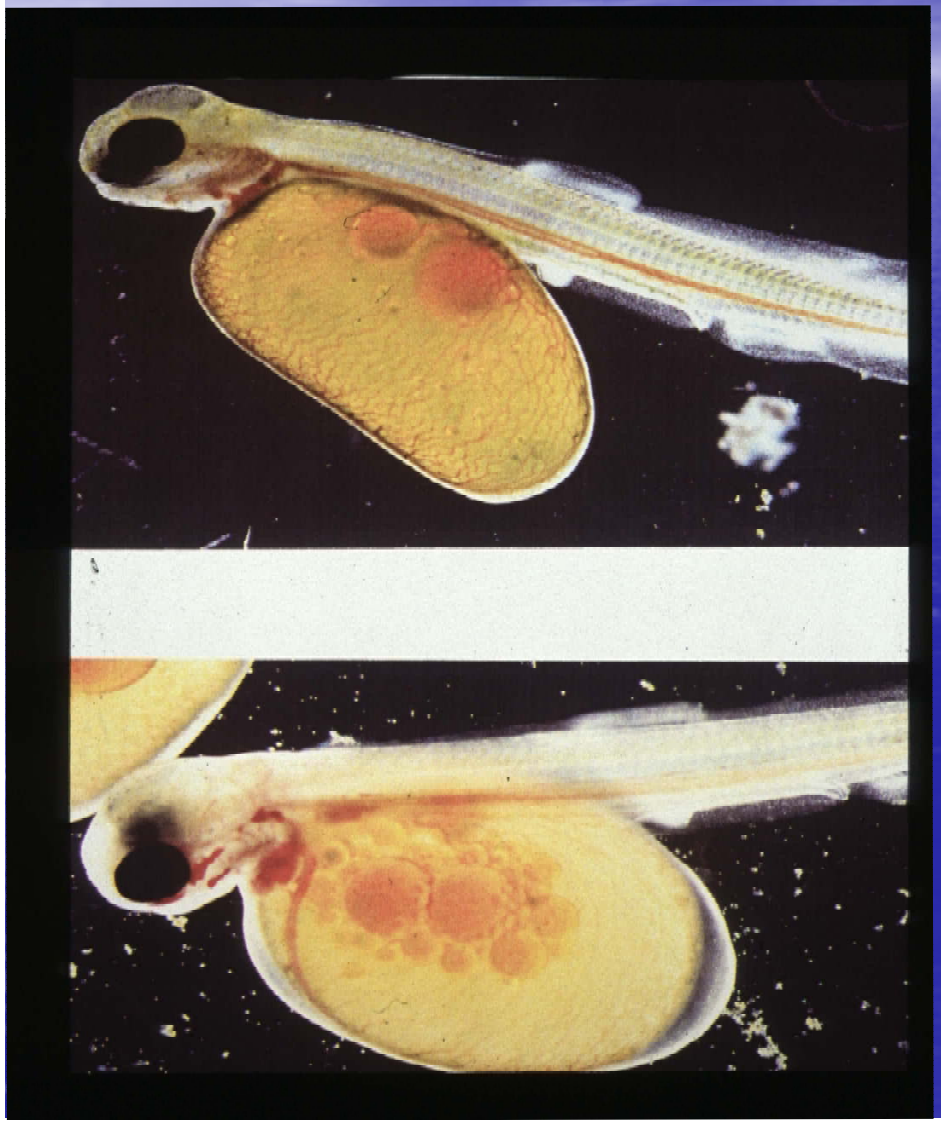
High yolk-sac fry mortality in salmonids

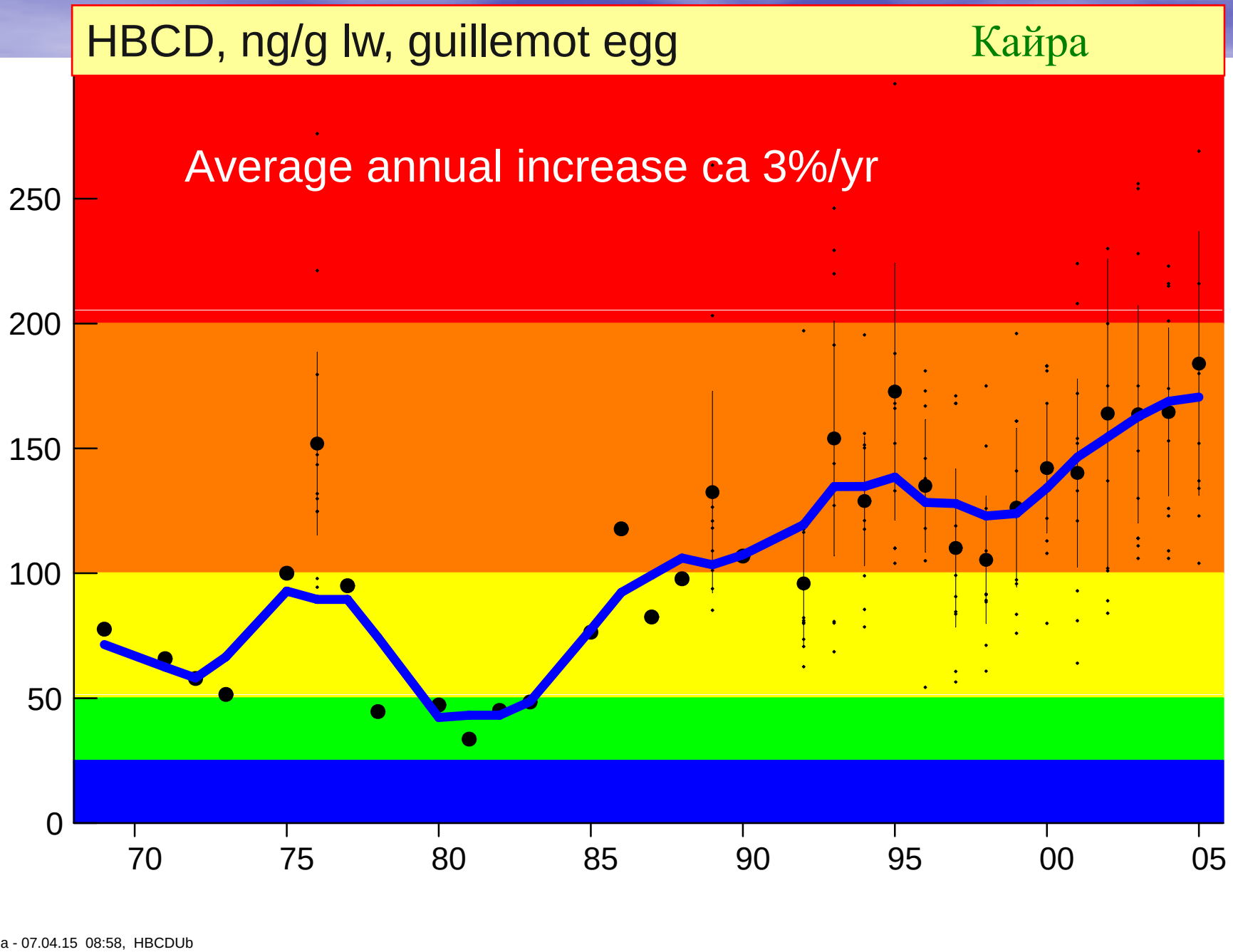


- Described early 1970s
- M74/Early mortality syndrome (EMS)
- 90% mortality 1990s
- Abnormal behaviour
- Toxicants
- Thiamine deficiency
- Ecosystem change

A new bird syndrome-similar to M74/EMS

- Discovered 2002
- Abnormal wiggling behaviour
- Kills thousands birds primarily gulls
- Cause not known
- Botulism?
- Thiamine deficiency?
- Pollutants?

Brominated flame retardants



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Biological threats-new species!

Envirovet Summer Institutes & Envirovet Baltic

About 400 individuals trained from 47 countries to date

The future concerns of both regions!

- Climate change & thereby altered conditions
- Overfishing-regulation different between countries
- Increased use of chemicals & pharmaceuticals
- Sewage treatment works, or even worse no sewage treatment
- Increased shipping
- Exotic species & changed food webs
- Reduction in biodiversity
- Transmission of diseases between regions, countries, wild & domestic animals

EHSA & the future

- Substantial holistic knowledge on ecosystem health & sustainable agriculture based on research & experience. Written by well-known experts within the BSR & the Great Lakes region.
- Suitable for continuing education for advisors
- University education to provide a solid background
- Large multiplying effect after the project ends as the educational package will be offered to all universities within the BSR & GLR
- Good platform for future research


EHSA
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A Regional University Network
Thank you for your
attention and interest!
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Svenska institutet
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