DERIVING WATER QUALITY STANDARDS (WQS) FOR PESTICIDES IN SWEDEN

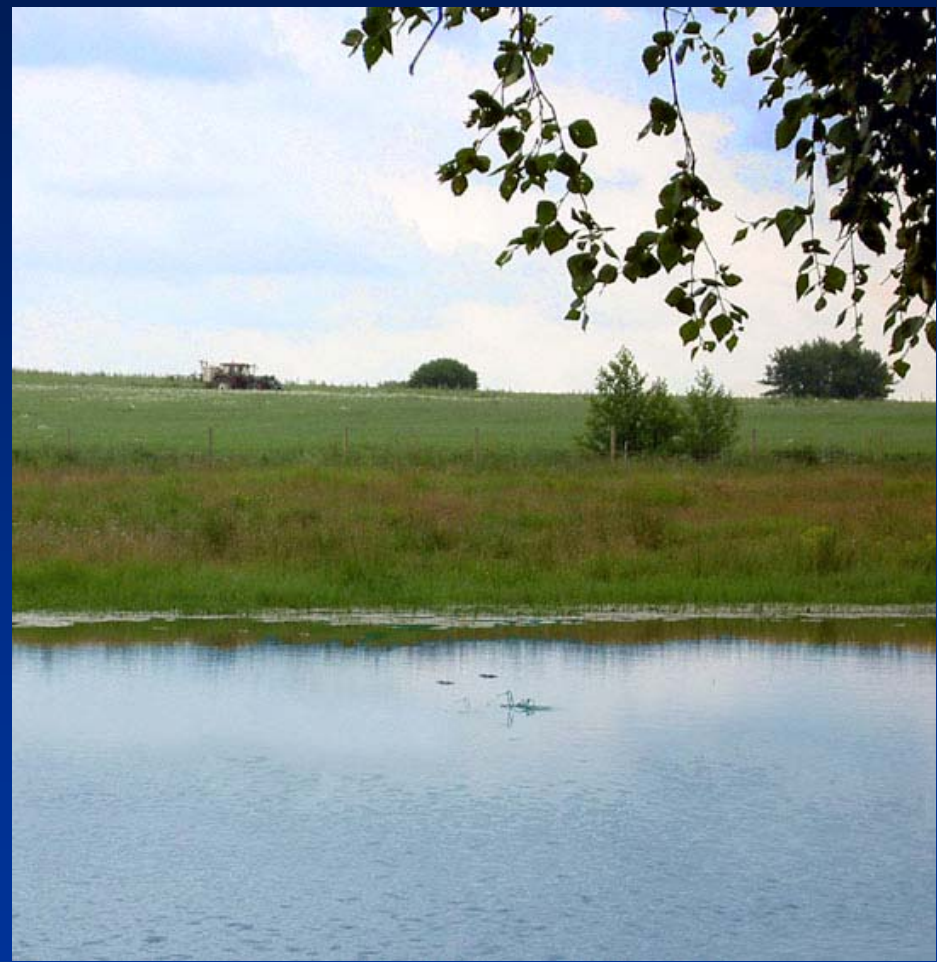
Jeanette Asp

Swedish Chemicals Inspectorate

KEMI
KEMIKALIEINSPEKTIONEN

WQS DEFINITION

“RIKTVÄRDEN FÖR YTVATTEN”



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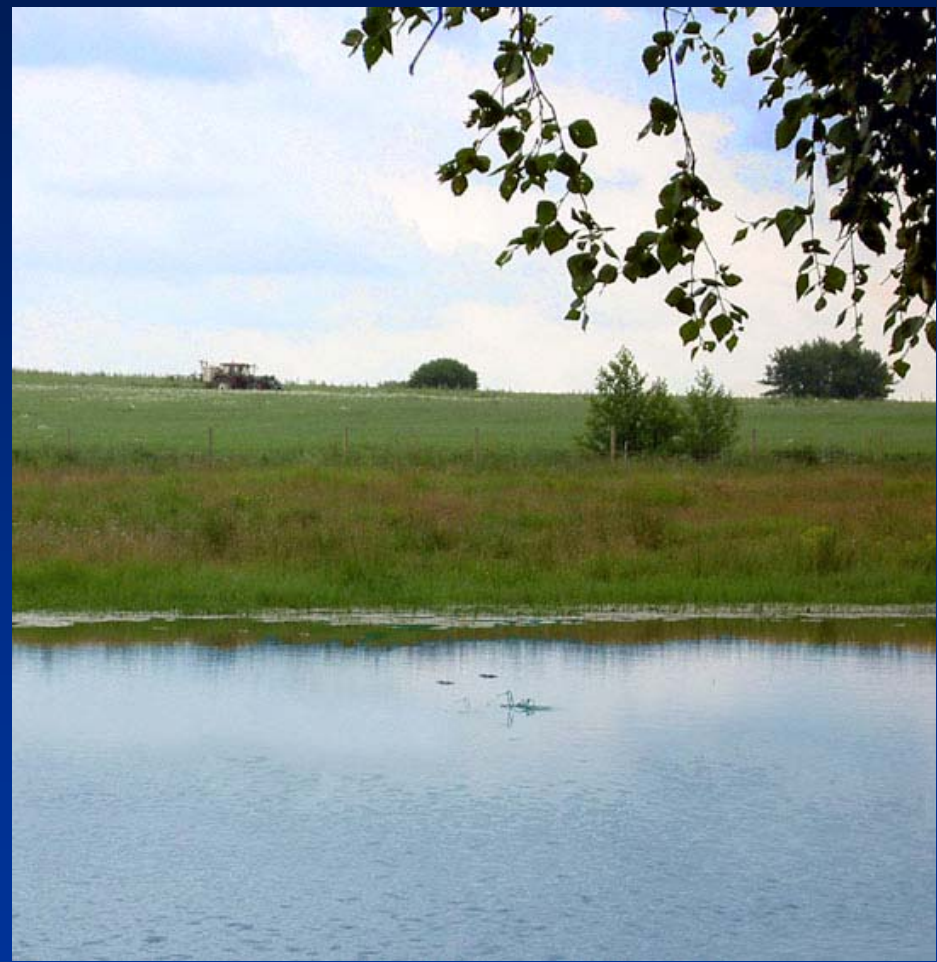
WQS DEFINITION

WQS are set to protect all water organisms against adverse effects that may be caused by exposure to a chemical substance



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WQS DEFINITION

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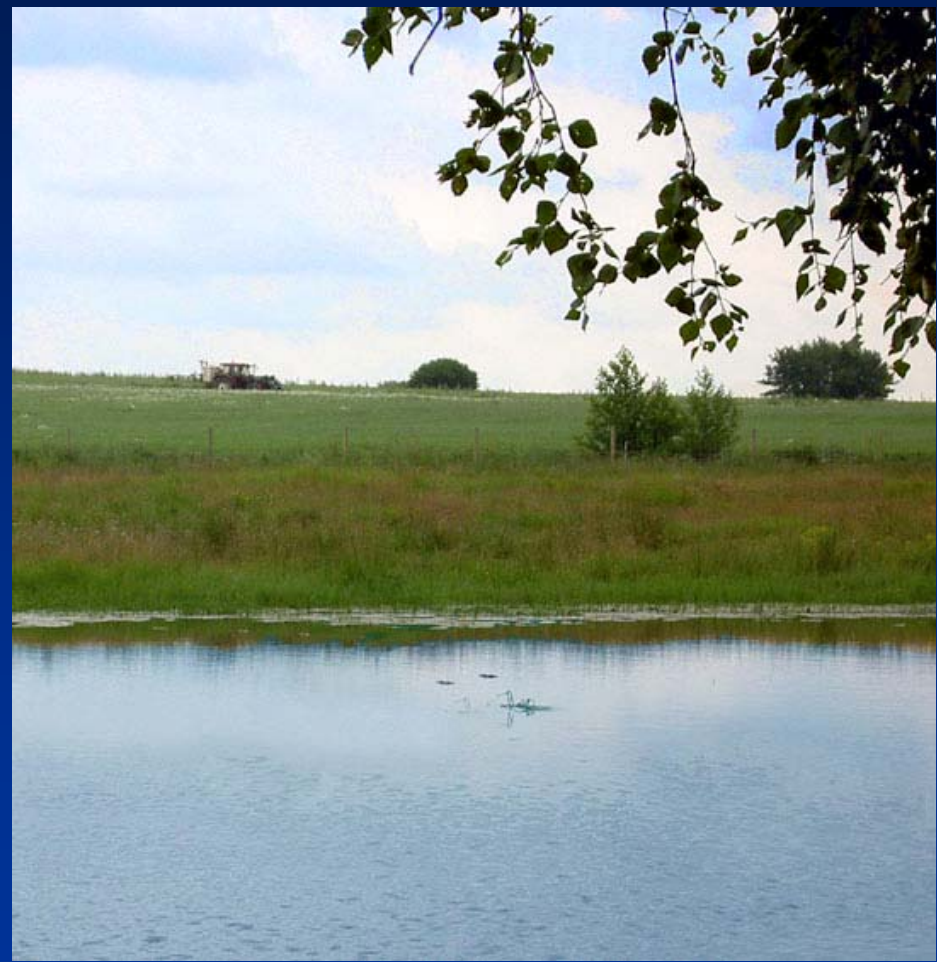
WQS are meant to reflect an exposure concentration below which unacceptable effects in the aquatic ecosystem will most likely not occur.



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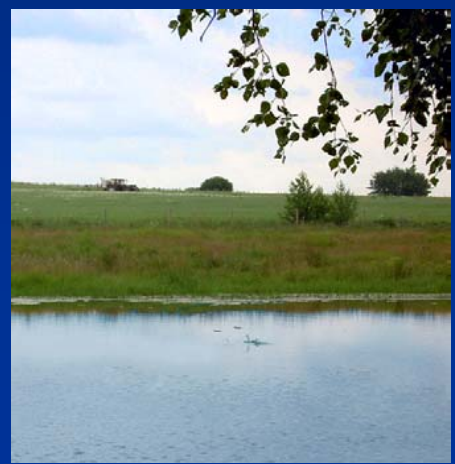
WQS

- ✓ General and apply to both marine and freshwater ecosystems.



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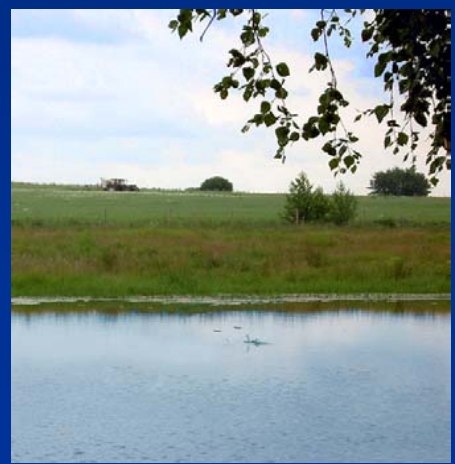
WQS

- ✓ General and apply to both marine and freshwater ecosystems.
- ✓ Expressed as dissolved concentrations of chemical substances



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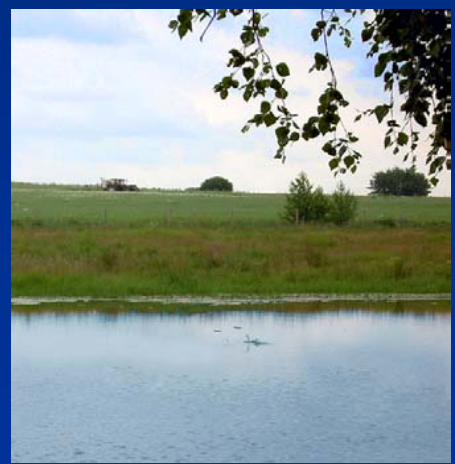
WQS

- ✓ General and apply to both marine and freshwater ecosystems.
- ✓ Expressed as dissolved concentrations of chemical substances
- ✓ Do not take site specific conditions into consideration



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WQS

- ✓ General and apply to both marine and freshwater ecosystems.
- ✓ Expressed as dissolved concentrations of chemical substances
- ✓ Do not take site specific conditions into consideration
- ✓ Guarantee protection against both chronic and acute effects

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The procedure for deriving WQS

Based on TGD

TECHNICAL GUIDANCE DOCUMENTS
IN SUPPORT OF
THE COMMISSION DIRECTIVE 93/67/EEC ON RISK ASSESSMENT FOR NEW NOTIFIED SUBSTANCES,
THE COMMISSION REGULATION (EC) 1488/94 ON RISK ASSESSMENT FOR EXISTING SUBSTANCES
AND
DIRECTIVE 98/8/EC CONCERNING THE PLACE OF THE BIOCIDAL PRODUCTS ON THE MARKET

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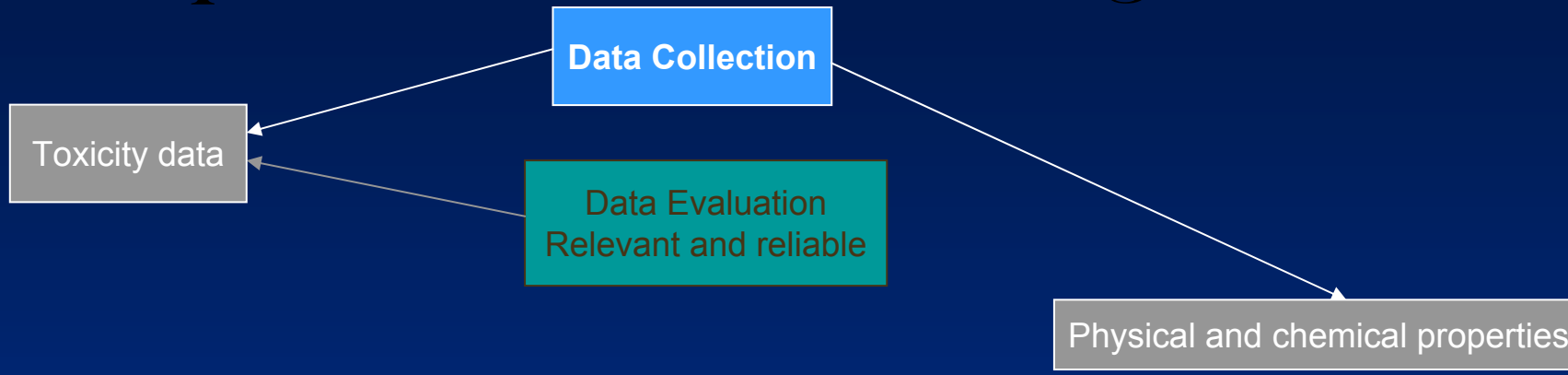
The procedure for deriving WQS



The procedure for deriving WQS

DATA COLLECTION

- Toxicity data (tests performed according to internationally accepted guidelines)

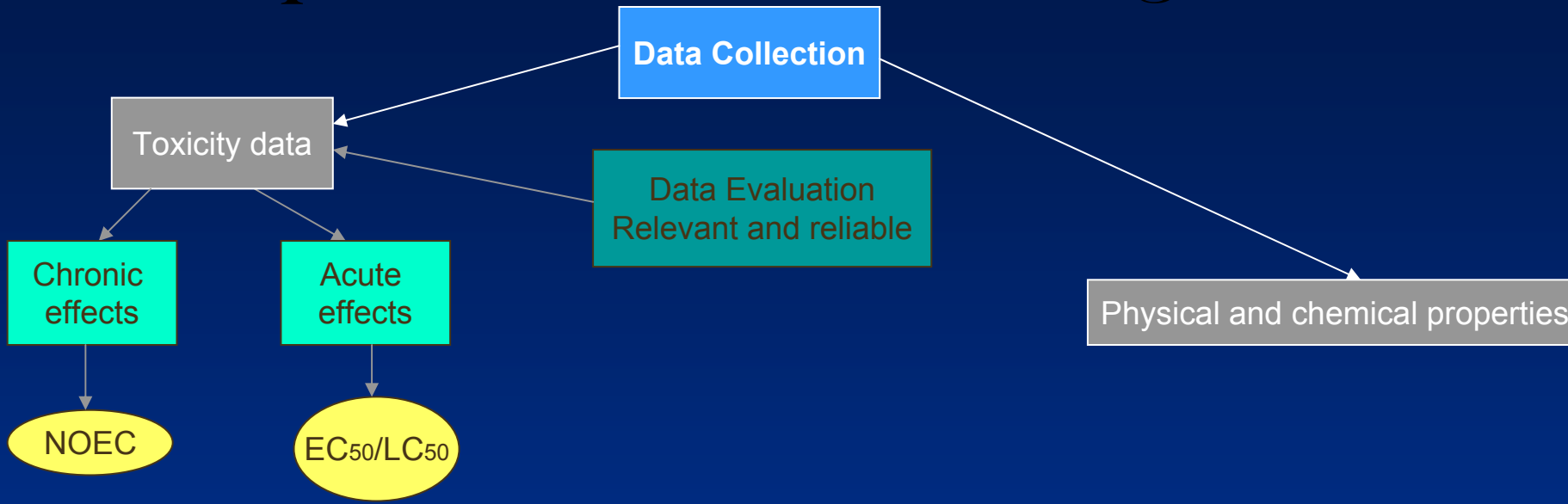
- Physical and chemical properties (persistence and bioaccumulation)

The procedure for deriving WQS

DATA COLLECTION

- Primarily, assessment reports produced by KemI, EU, OECD
- Databases: Riskline (KemI), Aquire and Pesticide Ecotoxicity Database of USEPA

The procedure for deriving WQS



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The procedure for deriving WQS

DATA SET

- Results from both chronic and acute toxicity tests
- Results performed on organisms representing three trophic levels:

Producers	- Algae
Primary consumers	- Daphnia
Secondary consumers	- Fish

The procedure for deriving WQS

DATA SET

Species	End-point	Exposure duration	Result [mg/L]	Reference
Algae				
Pseudokirschneriella subcapitatus	growth rate	96 h, static	EC_{50} 180 NOEC 50	1
Crustaceans				
Daphnia magna		48 h, static	LC_{50} 0.014[1)]	3
Daphnia magna		48 h, static	LC_{50} 0.019	3
Daphnia magna		48 h, flow-through	EC_{50} 0.0065[2)]	1
Daphnia magna	mortality growth reproduction	21 d, semi-static 21 d, semi-static 21 d, semi-static	NOEC 0.0017 NOEC 0.0009 NOEC 0.0017	1
Fish				
Oncorhynchus mykiss		96 h, semi-static	LC_{50} 32	1
Oncorhynchus mykiss		96 h, semi-static	LC_{50} 62[1)]	1
Oncorhynchus mykiss		96 h, flow-through	LC_{50} 29	3
Cyprinus carpio		96 h, semi static	LC_{50} 36	3
Cyprinus carpio		96 h, semi static	LC_{50} 158[1)]	3
Lepomis macrochirus		96 h, flow-through	LC_{50} 55	3
Oncorhynchus mykiss		28 d, semi-static	NOEC >18	4
Pimephales promelas	survival hatchability growth	36 d, flow-through 36 d, flow-through 36 d, flow-through	NOEC 24 NOEC 24 NOEC 10	5

[1)] Test performed on preparation. Value expressed as active substance.
[2)] Effect concentration basis for calculation of PNEC. Test substance purity 99.13%

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The procedure for deriving WQS

ECOSYSTEM SENSITIVITY DEPENDS ON THE MOST SENSITIVE SPECIES

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The procedure for deriving WQS

ECOSYSTEM SENSITIVITY DEPENDS ON THE MOST SENSITIVE SPECIES

Derivation of the standards should be based on

- ✓ The most sensitive species
- ✓ The lowest NOEC/L(E)C_{50}

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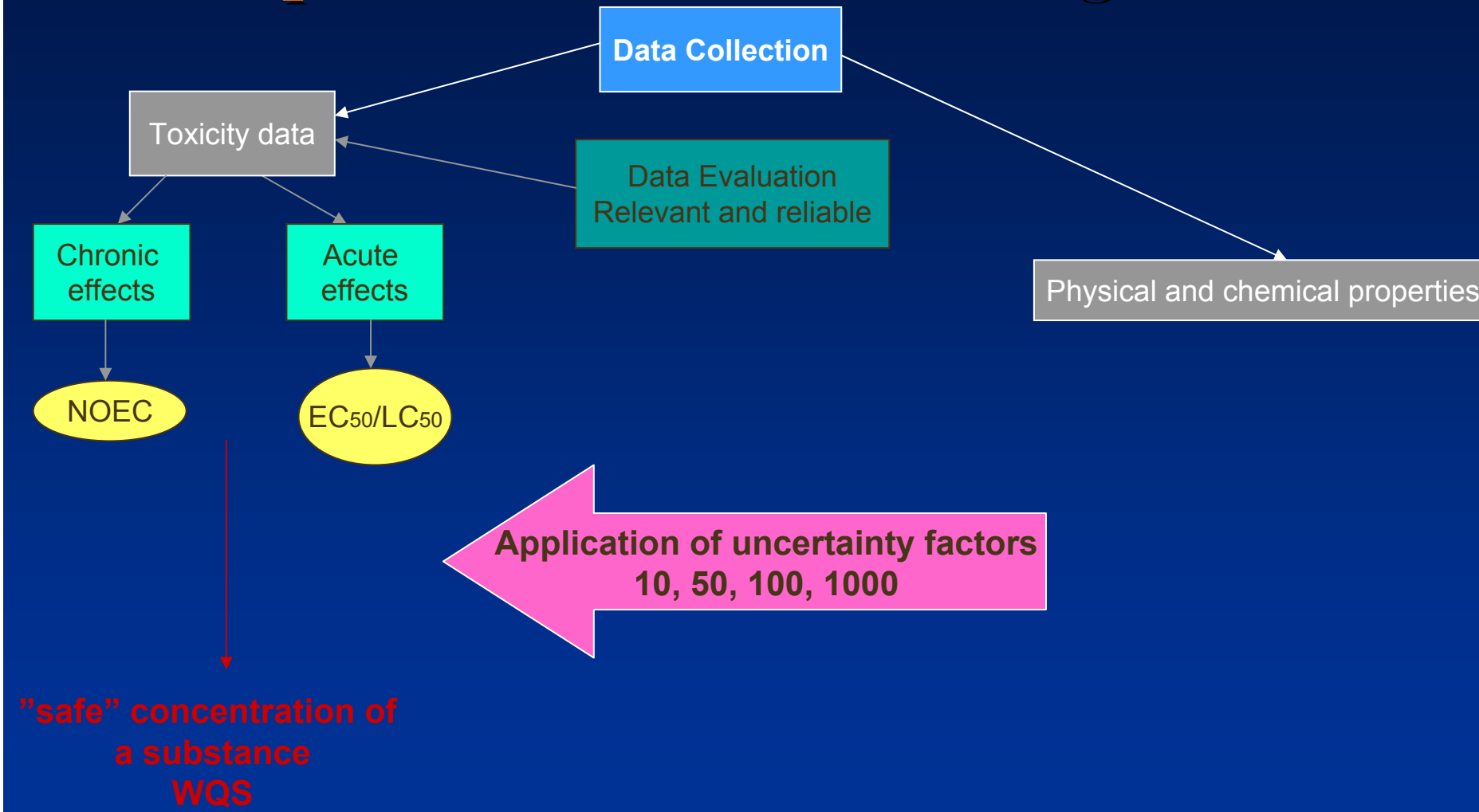
The procedure for deriving WQS



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WQS =

$$\frac{\text{The lowest NOEC/L(E)C50}}{\text{Uncertainty Factor}}$$

WQS =

The lowest NOEC/L(E)C50 x Uncertainty Factor

DATA AVAILABLE	UNCERTAINTY FACTOR
At least one short-term L(E)C50 from each of the three trophic levels of the base set (fish, Daphnia and algae)	1000
One long-term NOEC (either fish or Daphnia)	100
Two long-term NOEC values from species representing two trophic levels	50
Long-term NOEC values from at least three species representing three trophic levels	10
Field data and model ecosystem	Case-by-case basis

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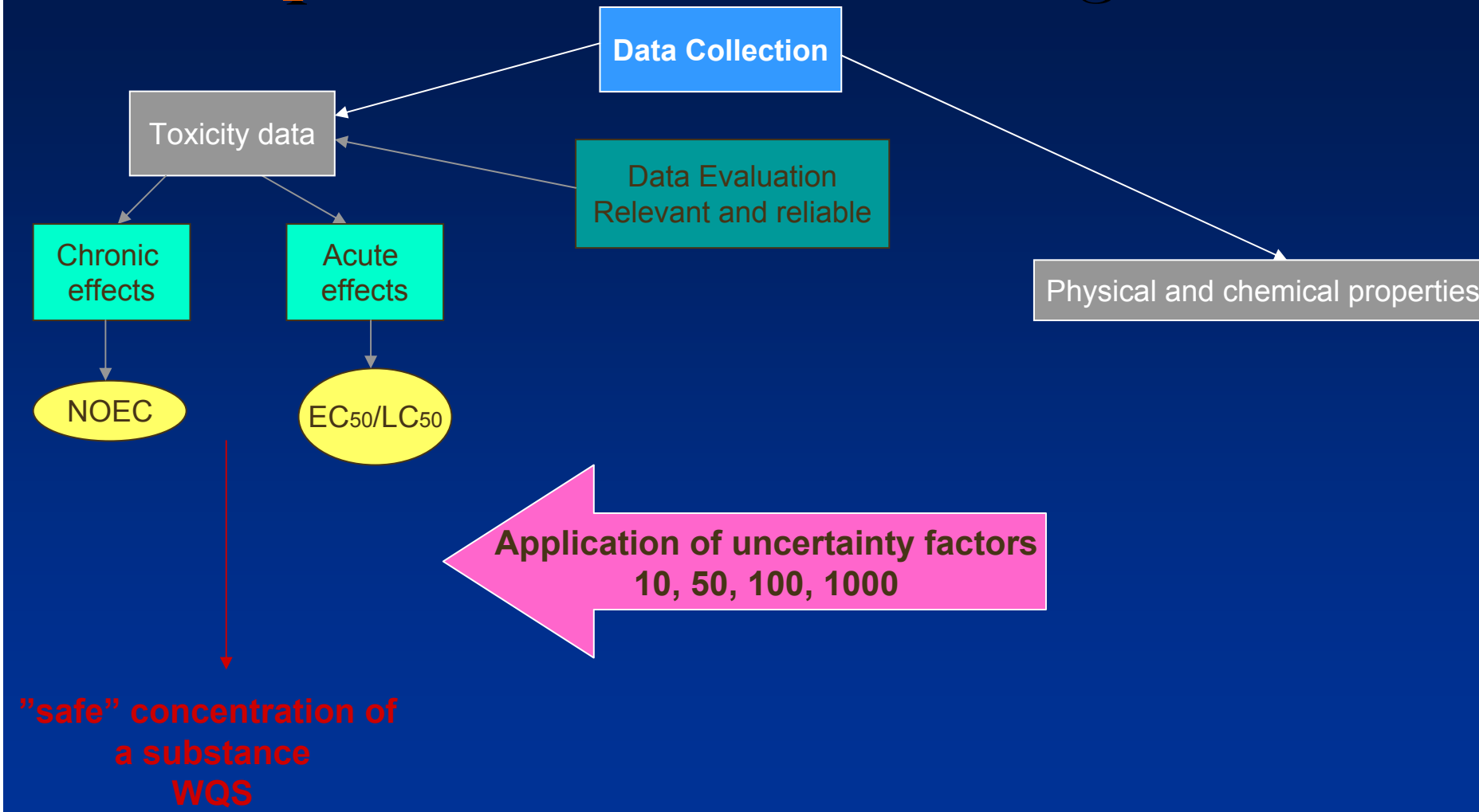
The procedure for deriving WQS



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WQS =

The lowest NOEC/L(E)C50
Uncertainty Factor

Uncertaity Factors:

- Lack of data

- Extrapolation of results from toxicity tests to aquatic systems

-Variations in sensitivity between different species

-Variations between different laboratories

- Synergistic and endocrine effects

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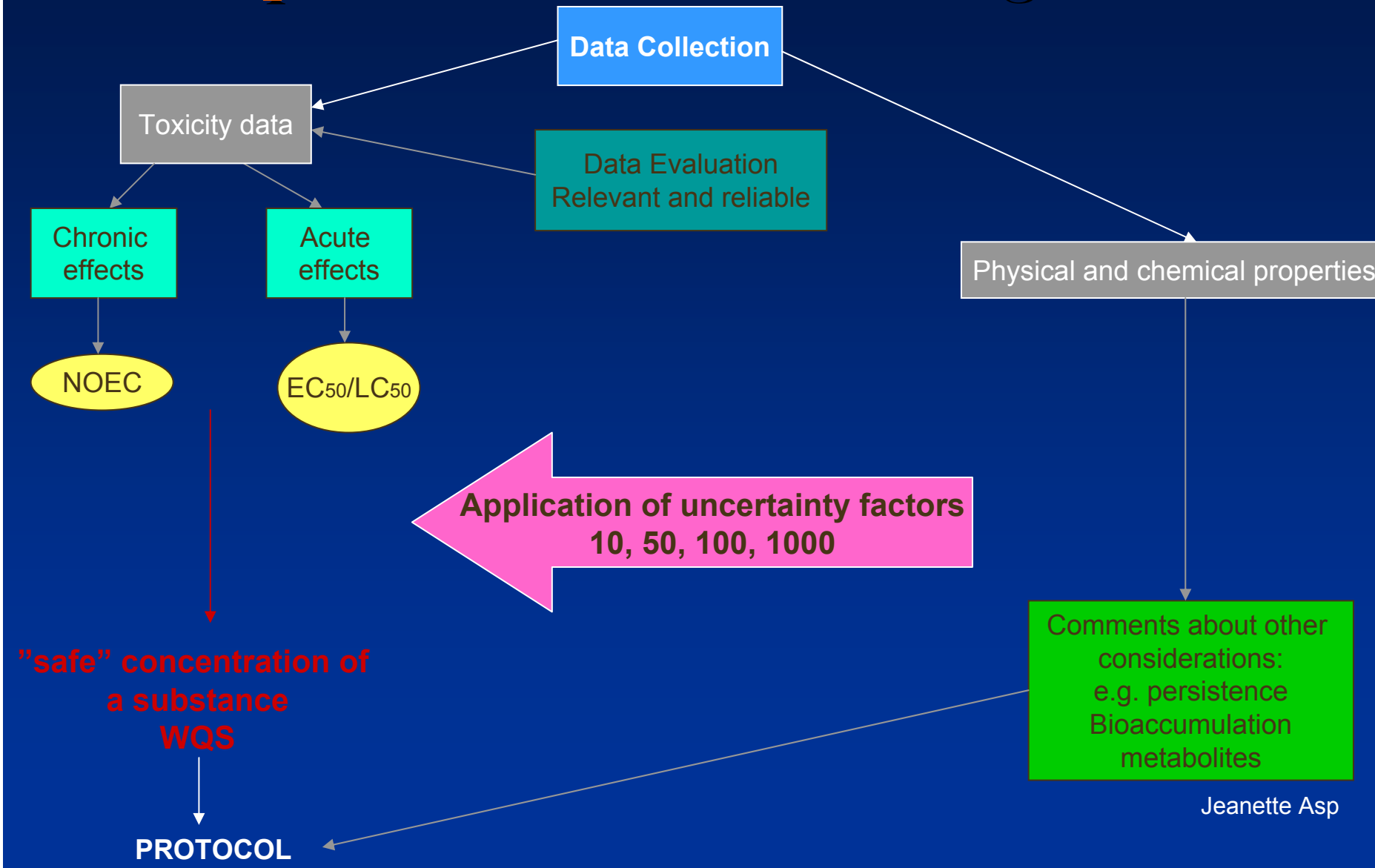
The procedure for deriving WQS



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WQS

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-The selection of substances is based on:

- Pesticides assessed within the existing monitoring program
- Substances notified on annex 1 (91/414/EEG)
- Statistics of volumes of sold amounts in Sweden

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– How do Swedish WQS compare to measured concentrations in surface waters?

VEMMENHÖGSSERIEN

Year	Number of findings above WQS
1993	84
1994	69
1995	57
1996	72
1997	59
1998	28
1999	19
2000	30
2001	34
2002	20
2003	15
2004	12

HOW ARE WQS APPLIED IN SWEDEN

Local authorities, county authorities, water boards and other actors in Sweden that makes measurements of pesticides in surface waters.

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WQS for measuring the progress towards achieving the environmental goal ‘A non toxic environment’

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WQS for measuring the progress towards achieving the environmental goal 'A non toxic environment'

Indicator based on WQS and measured concentration of pesticides in surface waters in the monitoring program.

Pesticide Toxicity Index – U.S Geological Survey

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Pesticide Toxicity Index

The sum of toxicity quotas

$$PTI = \sum_{i=1}^{n} \frac{E_i}{Riktv.i}$$

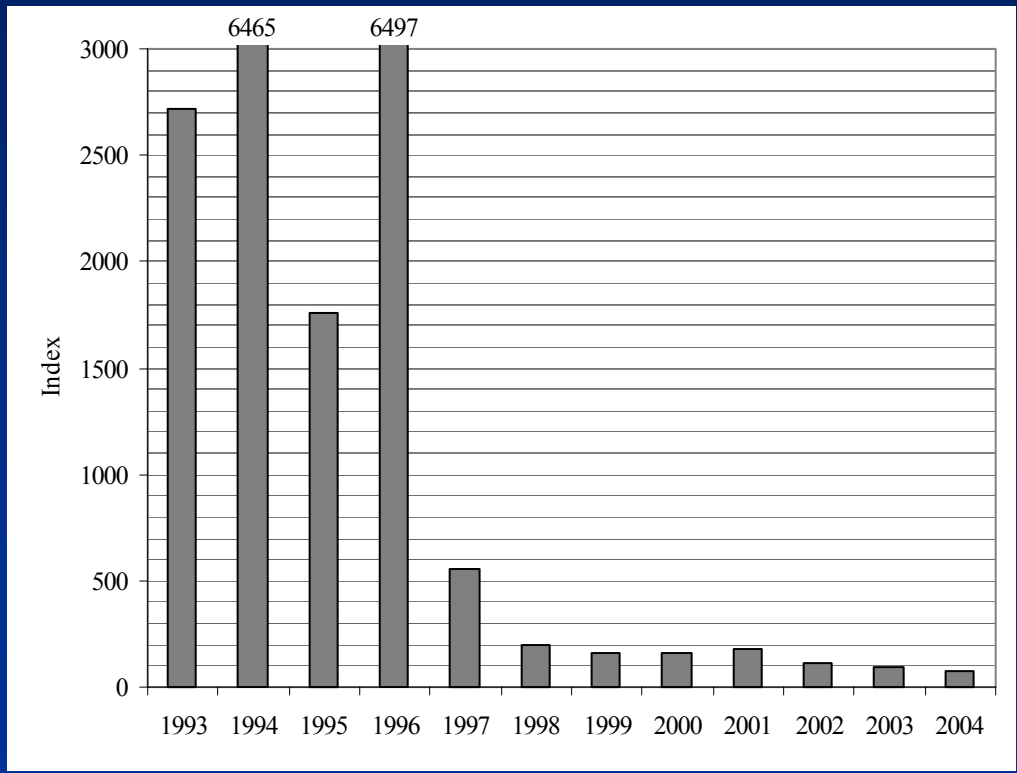
E*i* = Halt av bekämpningsmedel *i*

Riktv.*i* = Svenskt riktvärde för pesticid *i*

n = Antalet pesticider

Pesticide Toxicity Index

The sum of toxicity quotas



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