



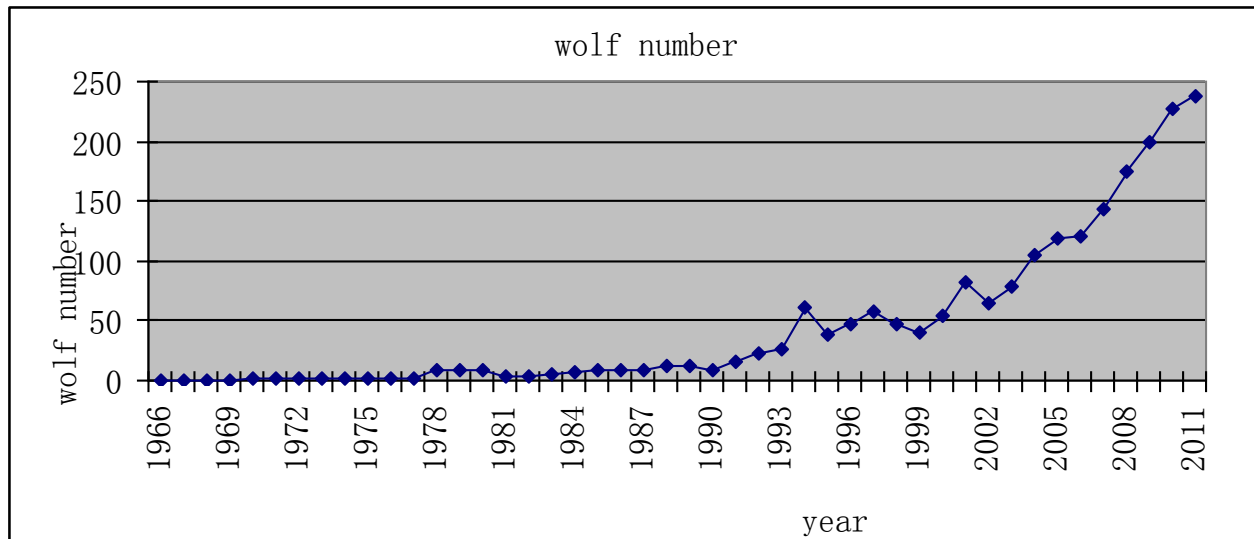
Balancing Stakeholder Interests for Sustainable Wolf Population Management in Sweden

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Background: wolves in Sweden

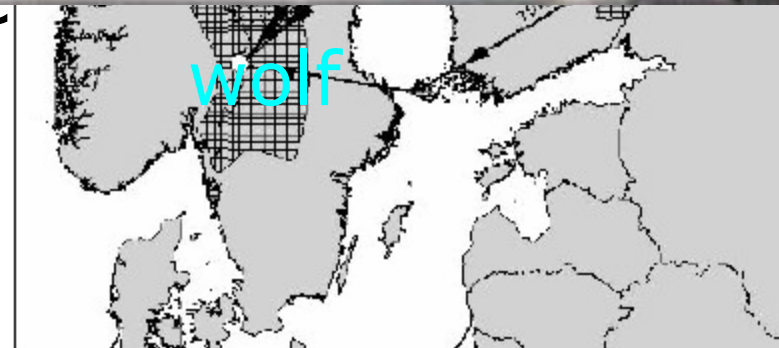
- In 1800s, the wolf population was around 1500
- Due to hunting activities, wolves almost went extinct by 1960s
- After wolf protection measures, the number recovered to 230.
- But this is still considered too low to maintain viable genetic diversity
- Other European countries manage higher wolf population number



Threats to wolf population

Biologists recommend at

- Inbreeding problem
- Allee effect
- Habitat loss
- Poaching
- Automobile
- Isolated by Sami



Conflicting sta

- City People
- Environment
- Hunters (-)
- Farmers (-)
- Reindeer herders
- Swedish Gov
- EU Commiss





Policy measures

- Compensation to farmers for livestock losses
- Preventative payment to farmers
- Tax
- Punishment for poaching
- Governmental Sami policy
- EU regulation
- Relocating wolves from Finland and Russia
- Development of wolf ecotourism

Stakeholder interests regarding wolves

Environmental aspect	Economical aspect	Social aspect
Biodiversity (+) Ecosystem services (+) ...	Tax (-) Compensation (+) Preventative payment (+) Fine for violating EU Directive (+) Ecotourism (+) Fine for poaching (-) ...	Biophilia (+) Fear of wolves (-) Hunting culture (-) Sami culture (-) ...



Research goal

- To find a sustainable wolf population management strategy that reconciles the interests of all the stakeholders



Research methodology

- Extensive literature review of stakeholder attitudes towards wolves
- Review of policy measures:
 - 1966: Law prohibiting wolf hunting
 - 1989: Law for imprison sentence
 - 1992: EU directive to protect wolves
 - 2010: Hunting permitted to stabilize the wolf number at 210
- Construction of a “satisfaction” function for all agents based on surveys and expert assessments



Relation between interests and wolf number

- Based on expert assessment, functional forms for stakeholder interests regarding wolves were designed
- Functions were calibrated using available data

“Satisfaction” function approach

- Use a “satisfaction” function to determine how different interests are combined
- $S = w_1 \times \text{environmental aspect} + w_2 \times \text{economical aspect} + w_3 \times \text{social aspect}$

Stakeholder interests regarding wolves

Environmental aspect

Biodiversity (+)

Ecosystem services (+)

...

Economical aspect

Tax (-)

Compensation (+)

Preventative payment (+)

Fine (+)

Ecotourism (+)

...

Social aspect

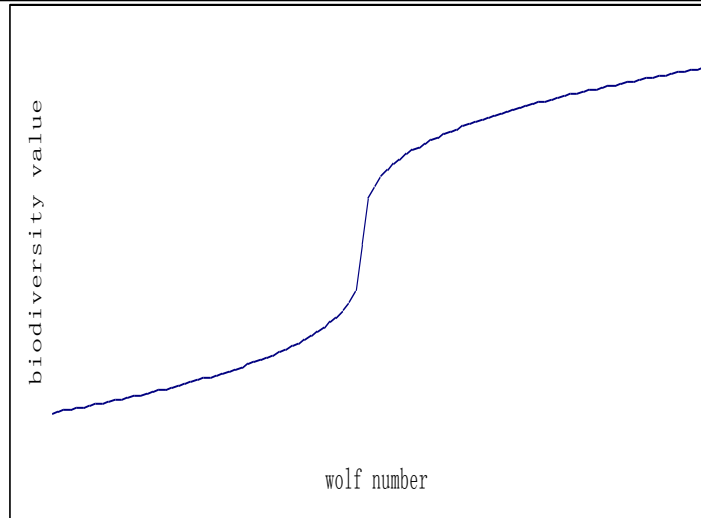
Biophilia (+)

Fear of wolves (-)

Hunting culture (-)

Reindeer herding culture (-)

...



Stakeholder interests regarding wolves

Environmental aspect

Biodiversity (+)
Ecosystem services (+)

...

Economical aspect

Tax (-)

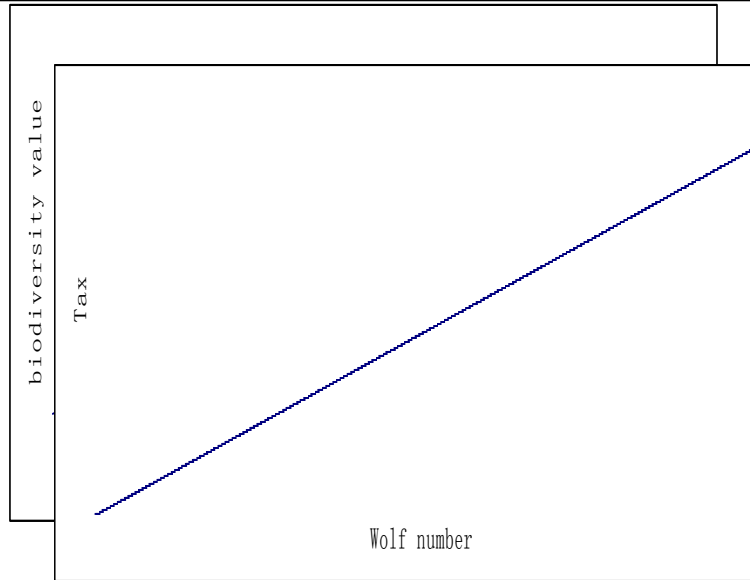
Compensation (+)
Preventative payment (+)
Fine (+)
Ecotourism (+)

...

Social aspect

Biophilia (+)
Fear of wolves (-)
Hunting culture (-)
Reindeer herding culture (-)

...



Stakeholder interests regarding wolves

Environmental aspect

Biodiversity (+)
Ecosystem services (+)

...

Economical aspect

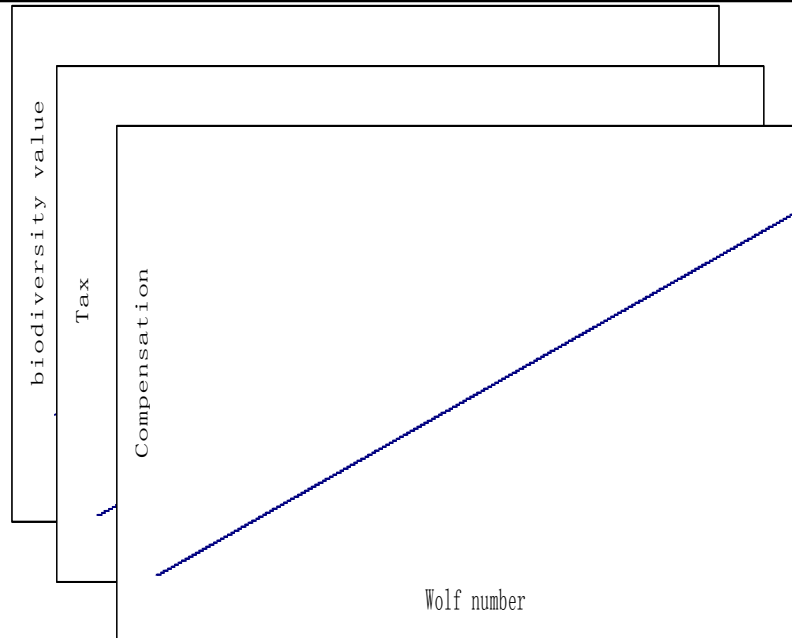
Tax (-)
Compensation (+)
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Fine (+)
Ecotourism (+)

...

Social aspect

Biophilia (+)
Fear of wolves (-)
Hunting culture (-)
Reindeer herding culture (-)

...



Stakeholder interests regarding wolves

Environmental aspect

Biodiversity (+)
Ecosystem services (+)

...

Economical aspect

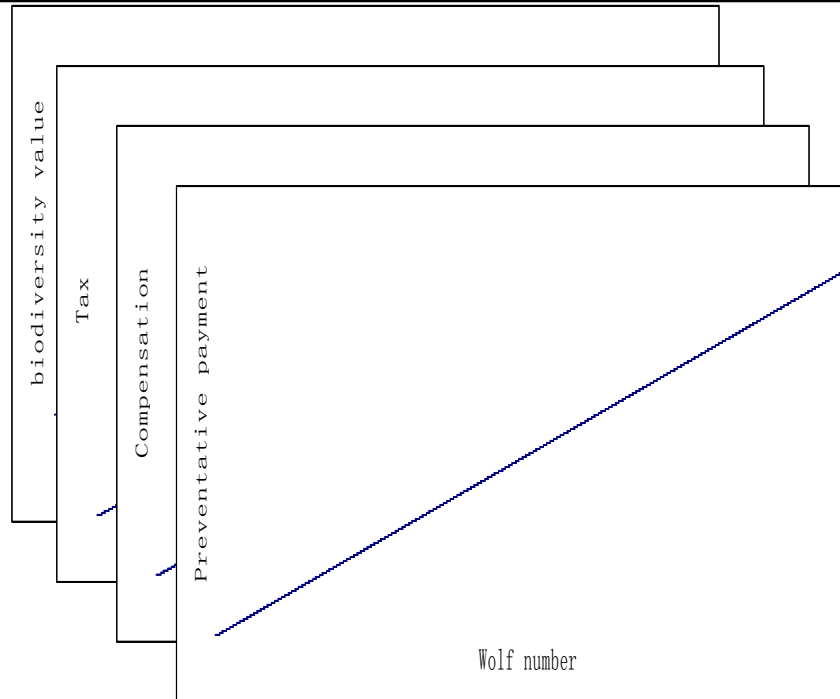
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...

Social aspect

Biophilia (+)
Fear of wolves (-)
Hunting culture (-)
Reindeer herding culture (-)

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Stakeholder interests regarding wolves

Environmental aspect

Biodiversity (+)
Ecosystem services (+)

...

Economical aspect

Tax (-)
Compensation (+)
Preventative payment (+)

Fine (+)

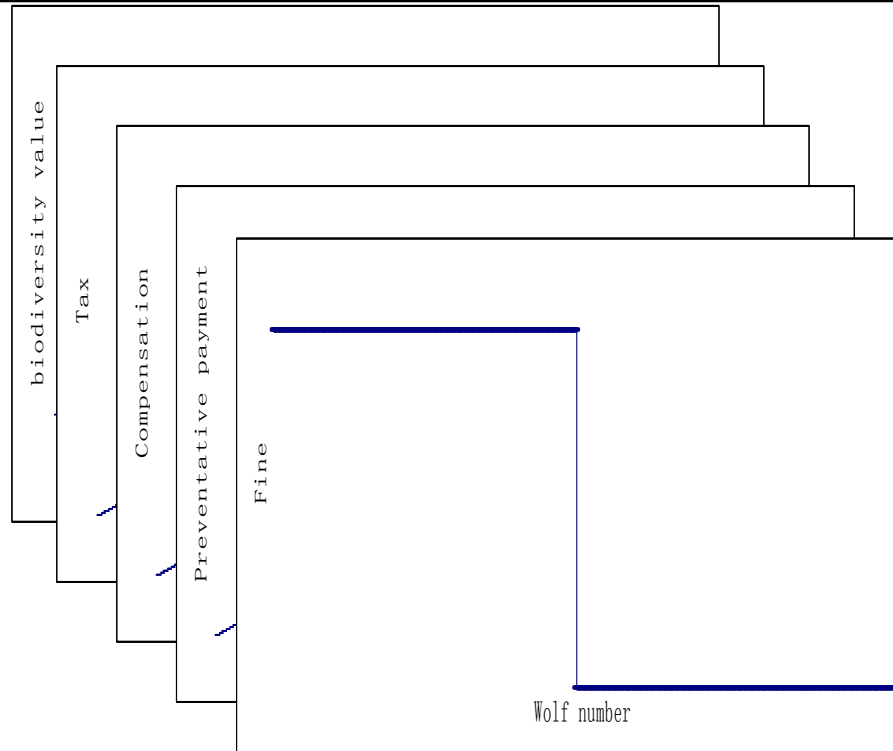
Ecotourism (+)

...

Social aspect

Biophilia (+)
Fear of wolves (-)
Hunting culture (-)
Reindeer herding culture (-)

...



Stakeholder interests regarding wolves

Environmental aspect

Biodiversity (+)
Ecosystem services (+)

...

Economical aspect

Tax (-)
Compensation (+)
Preventative payment (+)
Fine (+)

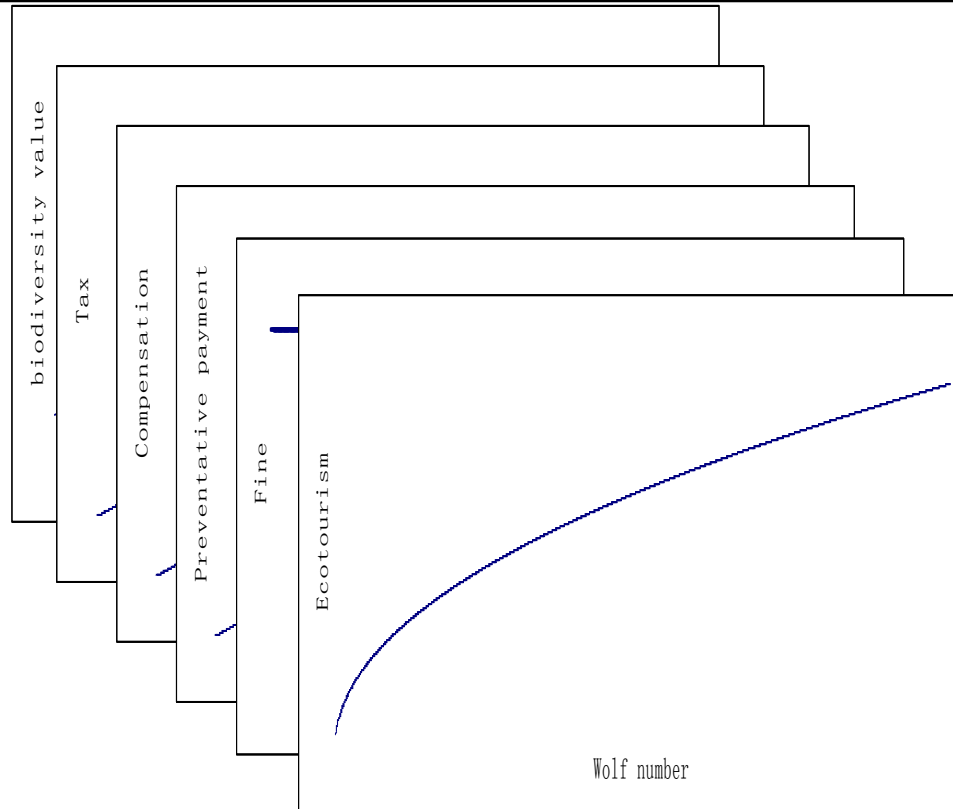
Ecotourism (+)

...

Social aspect

Biophilia (+)
Fear of wolves (-)
Hunting culture (-)
Reindeer herding culture (-)

...



Stakeholder interests regarding wolves

Environmental aspect

Biodiversity (+)
Ecosystem services (+)

...

Economical aspect

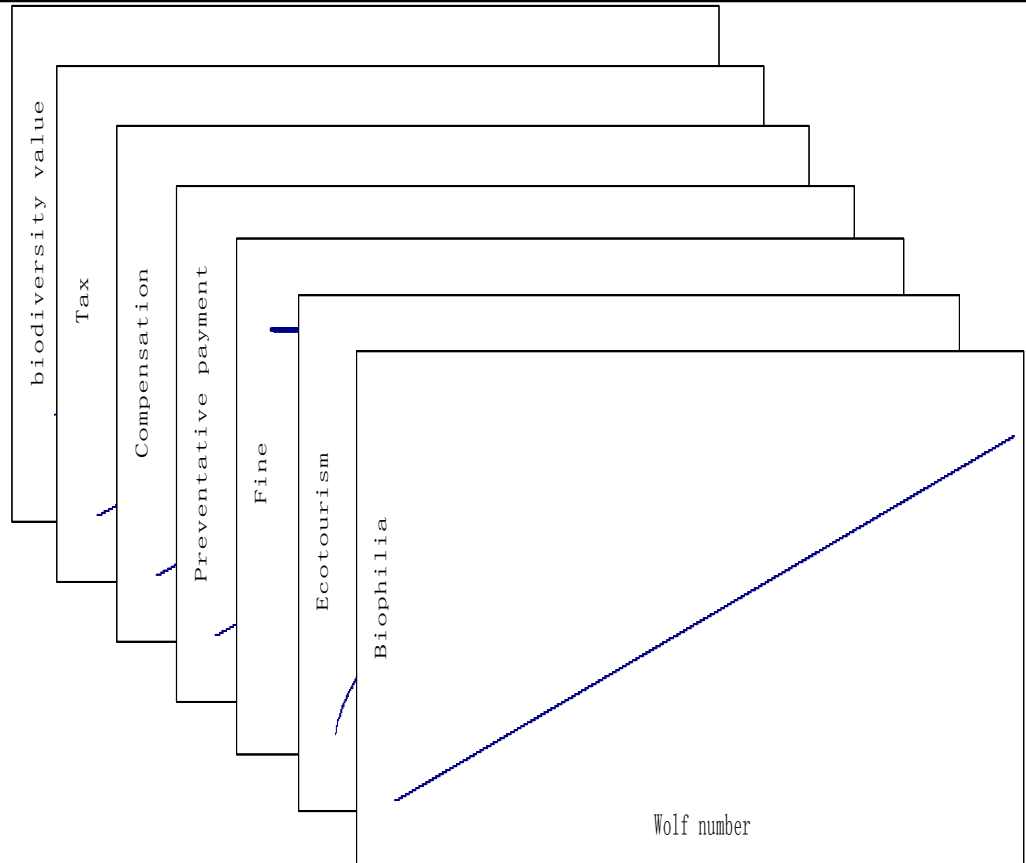
Tax (-)
Compensation (+)
Preventative payment (+)
Fine (+)
Ecotourism (+)

...

Social aspect

Biophilia (+)
Fear of wolves (-)
Hunting culture (-)
Reindeer herding culture (-)

...



Stakeholder interests regarding wolves

Environmental aspect

Biodiversity (+)
Ecosystem services (+)

...

Economical aspect

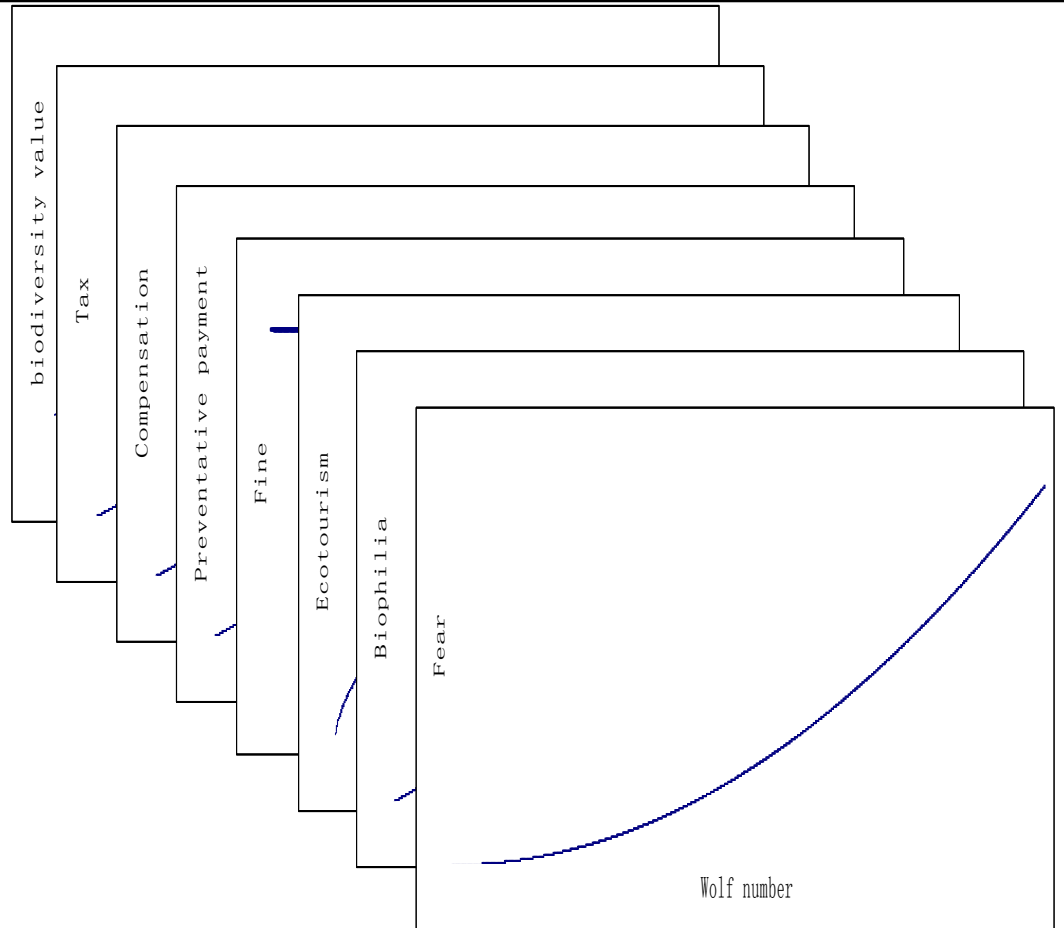
Tax (-)
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Preventative payment (+)
Fine (+)
Ecotourism (+)
Biophilia (+)

...

Social aspect

Biophilia (+)
Fear of wolves (-)
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Stakeholder interests regarding wolves

Environmental aspect

Biodiversity (+)
Ecosystem services (+)

...

Economical aspect

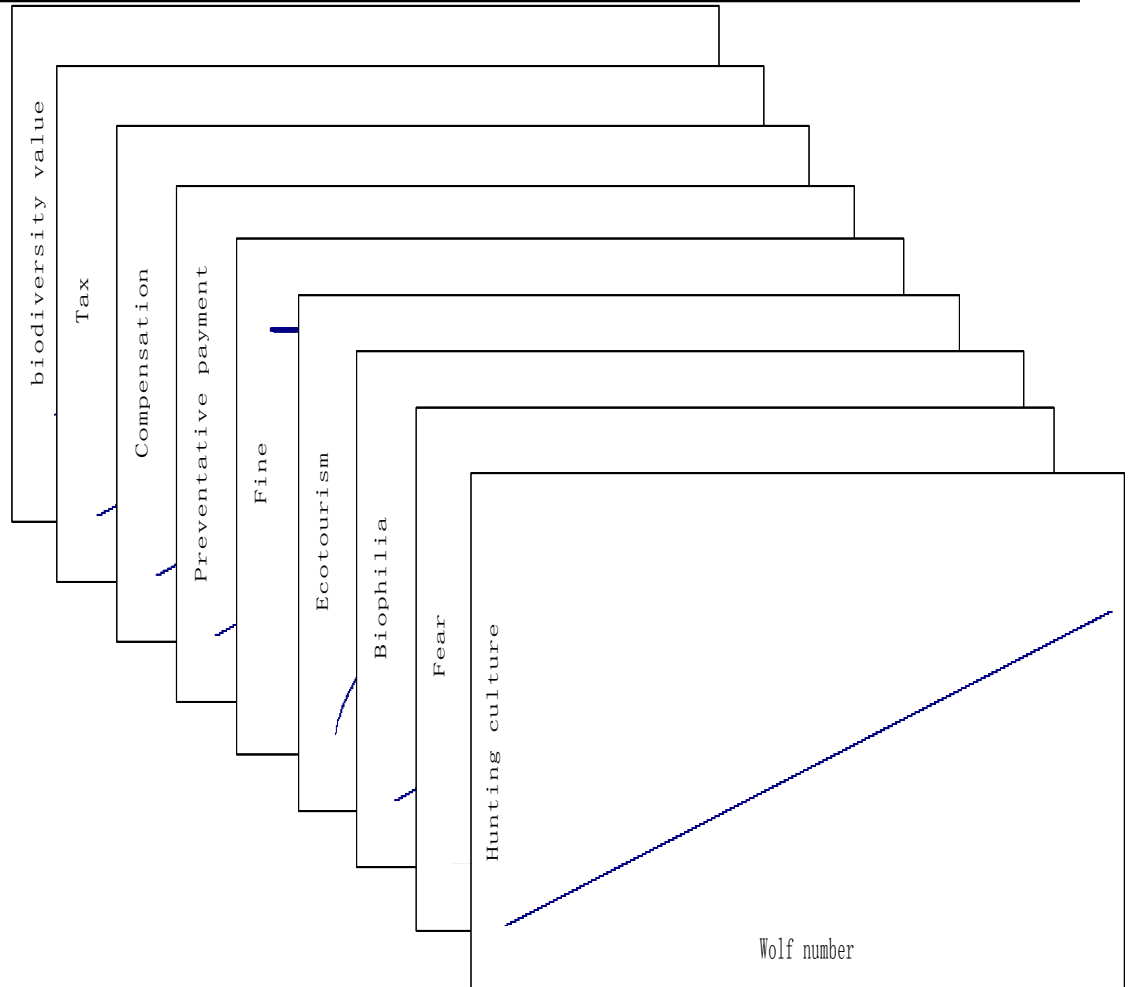
Tax (-)
Compensation (+)
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Fine (+)
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...

Social aspect

Biophilia (+)
Fear of wolves (-)
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Reindeer herding culture (-)

...



Stakeholder interests regarding wolves

Environmental aspect

Biodiversity (+)
Ecosystem services (+)

...

Economical aspect

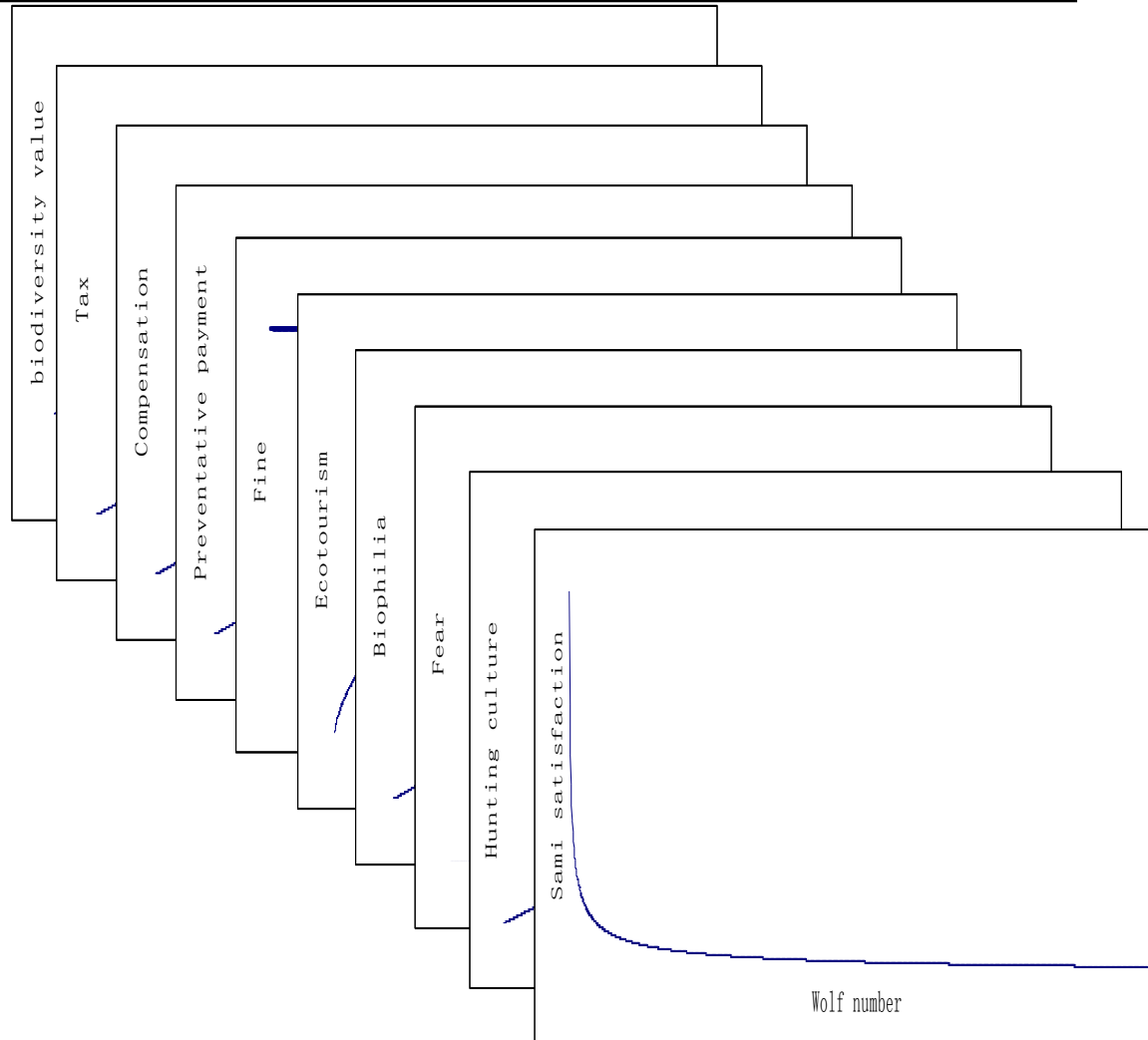
Tax (-)
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Social aspect

Biophilia (+)
Fear of wolves (-)
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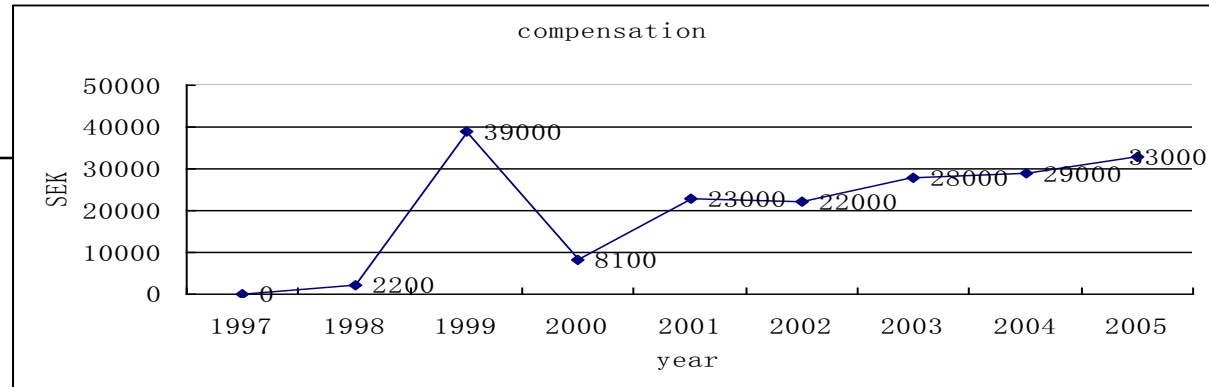


Matrix of agent interests

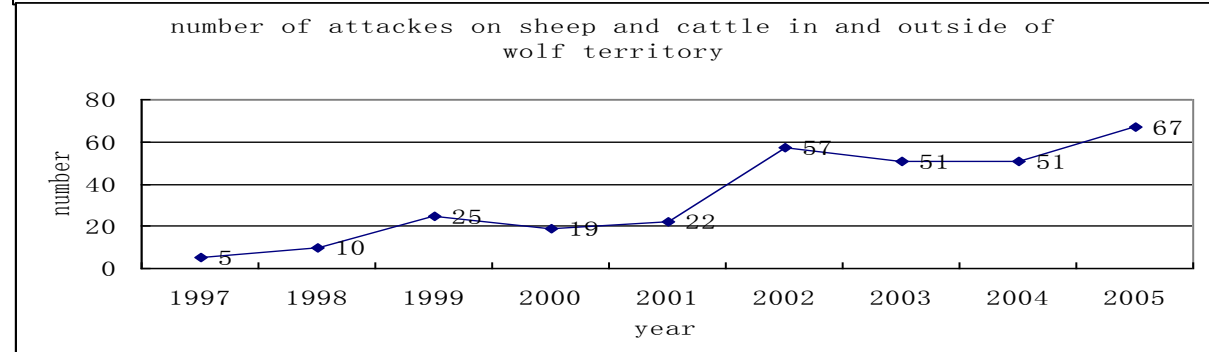
	Environmental aspect	Economical aspect	Social aspect
City people Environmentalists	Biodiversity (+) Ecosystem services (+)	Tax (-) Fine (+)	Biophilia (+) Fear of wolves (-)
Hunters	Biodiversity (+) Ecosystem services (+)	Tax (-) Fine (+)	Biophilia (+) Fear of wolves (-) Hunting culture (-)
Farmers	Biodiversity (+) Ecosystem services (+)	Tax (-) Fine (+) Compensation (+) Preventative payment (+) Ecotourism (+)	Biophilia (+) Fear of wolves (-)
Swedish government	Biodiversity (+) Ecosystem services (+)	Tax (-) Fine (+)	
Reindeer herders	Biodiversity (+) Ecosystem services (+)	Tax (-) Fine (+)	Biophilia (+) Fear of wolves (-) Reindeer Herder culture (-)

First calibration with existing data

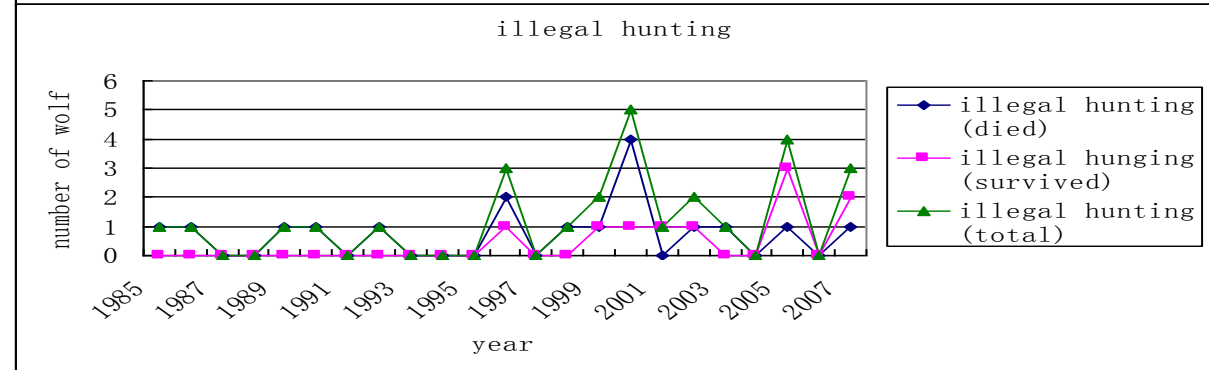
Compensation



Number of attacks

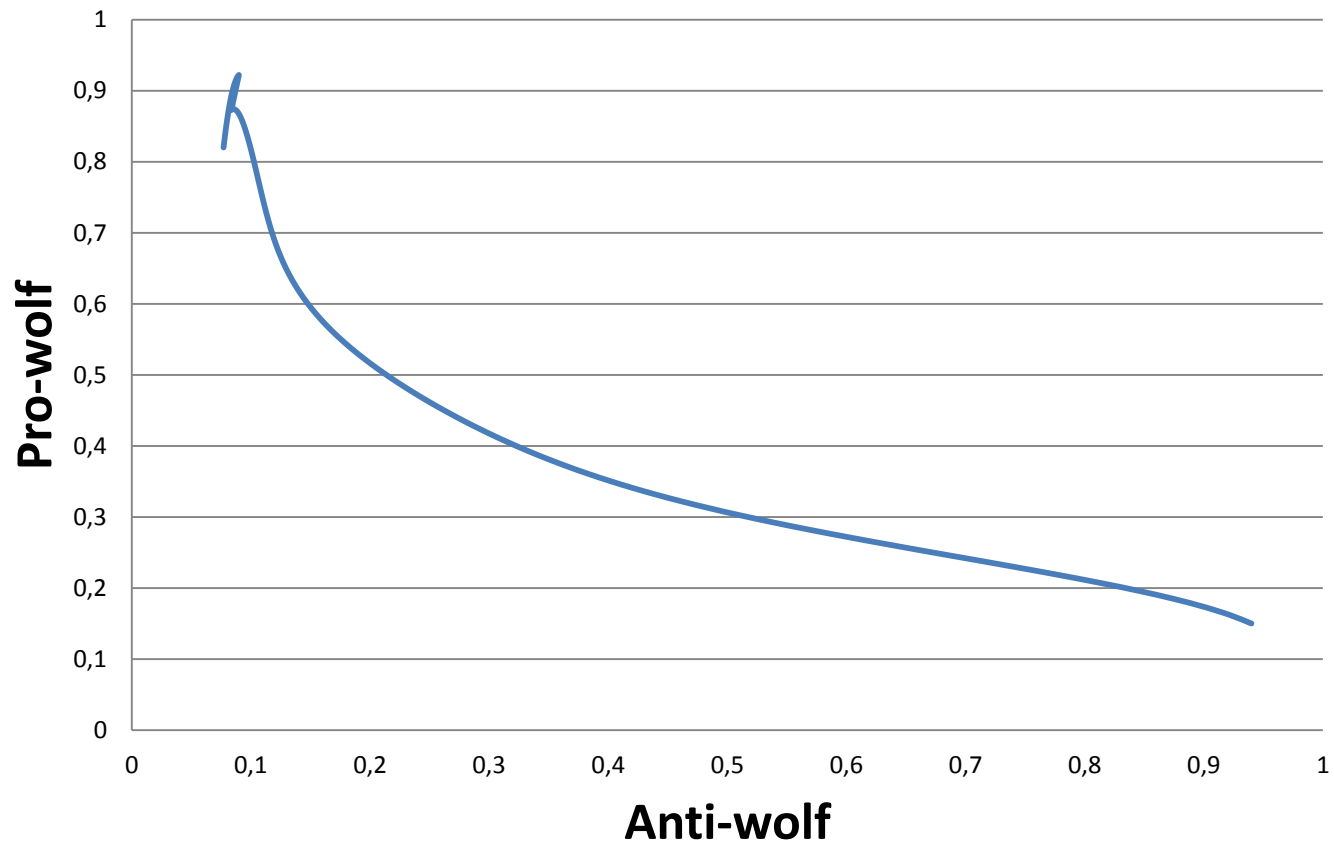


Illegal hunting rate



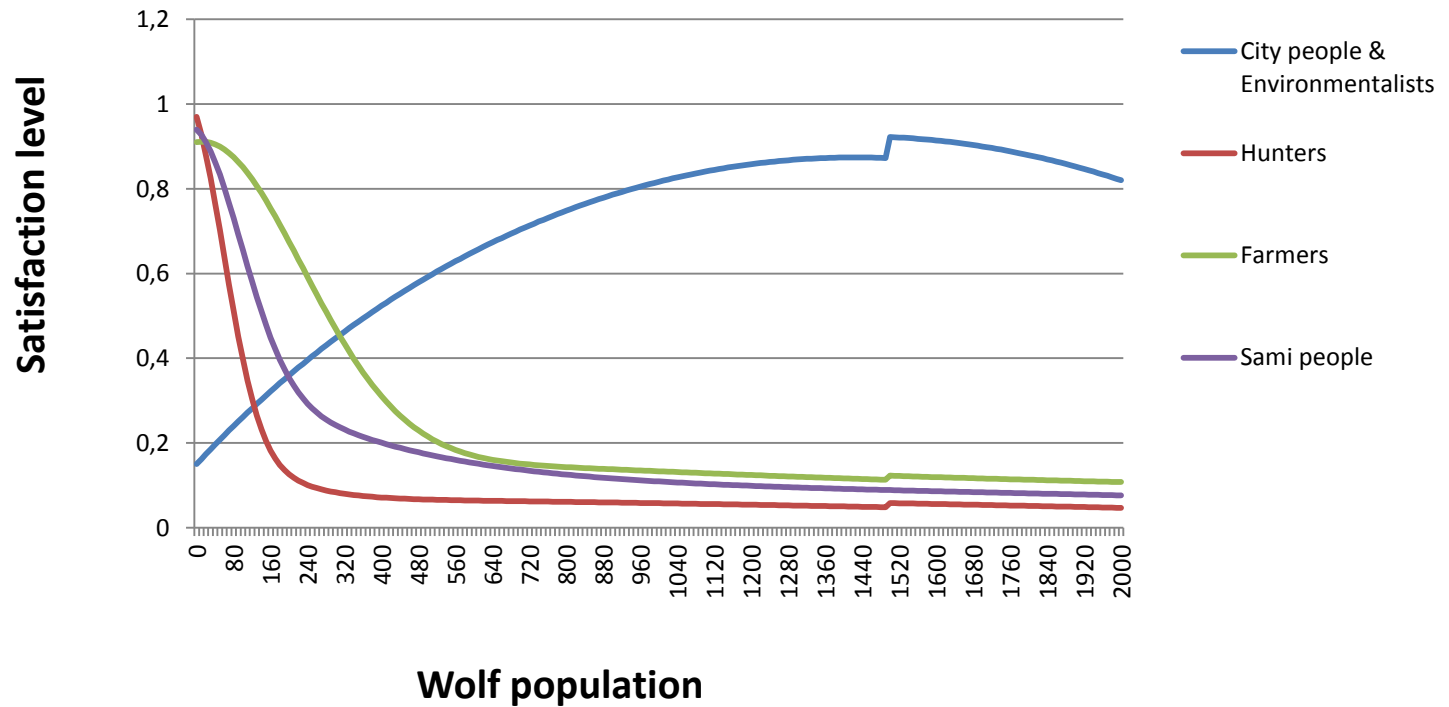
Attitudes, willingness to pay, etc.

Phase diagram



Equal satisfaction point

Satisfaction level of different stakeholders





Next steps

- Incorporate more data
- Figure out the major satisfaction functions with real stakeholders
- Add more expert opinions including surveys
- Analyze satisfaction against changes in policy measures
- Make sensitivity analysis



Thank you!