alpenkonvention · convention alpine
convenzione delle alpi · alpska konvencija

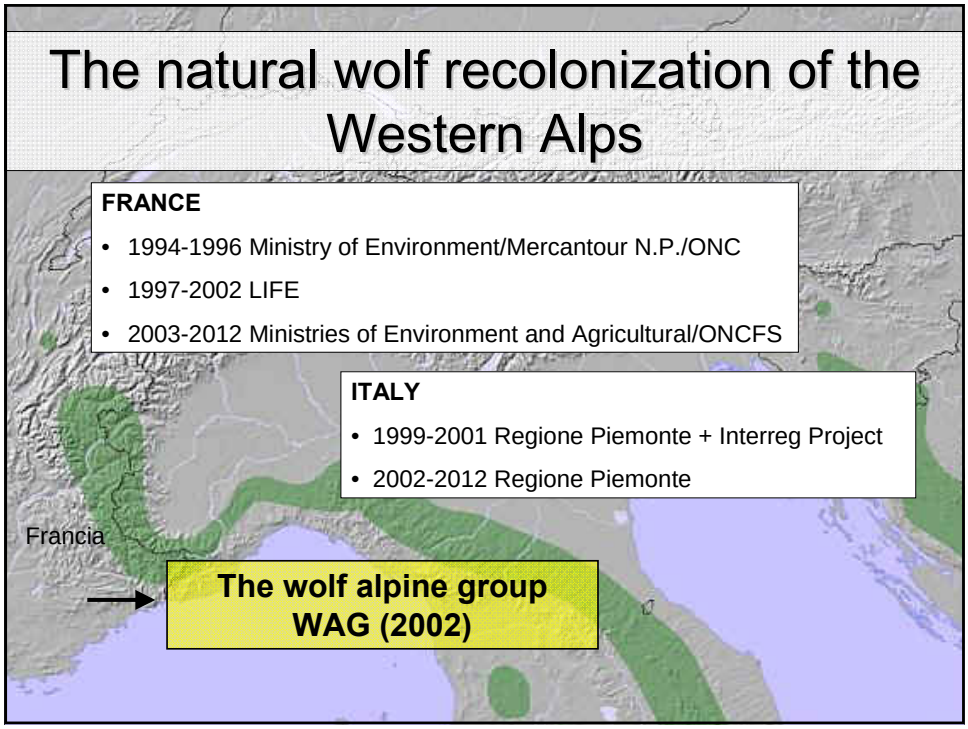
First WISO Conference

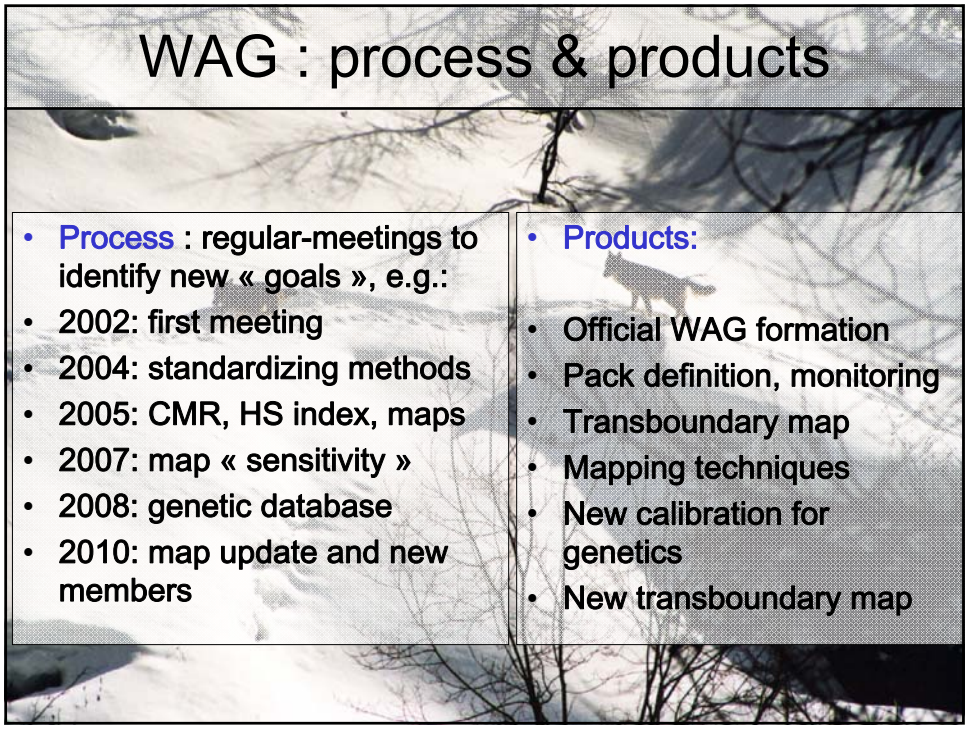
Innsbruck, 26th- 28th April 2012

Wolf monitoring in the Alps

F. Marucco, C. Duchamp, E. Avanzinelli, & E. Marboutin

The natural wolf recolonization of the Western Alps


The natural wolf recolonization of the Western Alps
FRANCE
• 1994-1996 Ministry of Environment/Mercantour N.P./ONC
• 1997-2002 LIFE
• 2003-2012 Ministries of Environment and Agricultural/ONCFS
ITALY
• 1999-2001 Regione Piemonte + Interreg Project
• 2002-2012 Regione Piemonte
Francia
The wolf alpine group WAG (2002)


WAG : process & products
• Process : regular-meetings to identify new « goals », e.g.:
• 2002: first meeting
• 2004: standardizing methods
• 2005: CMR, HS index, maps
• 2007: map « sensitivity »
• 2008: genetic database
• 2010: map update and new members
• Products:
• Official WAG formation
• Pack definition, monitoring
• Transboundary map
• Mapping techniques
• New calibration for genetics
• New transboundary map

Fabbri et al. 2007. From the Apennines to the Alps: colonization genetics of the naturally expanding Italian wolf population. Molecular Ecology 16:1661-1671.

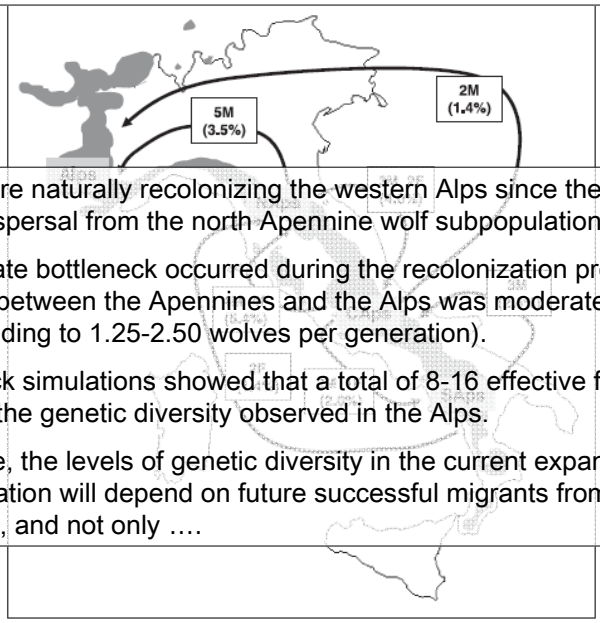


Fig. 1 Approximate wolf (*Canis lupus*) distribution range in Italy

- Wolves are naturally recolonizing the western Alps since the late 80's through dispersal from the north Apennine wolf subpopulation.
- A moderate bottleneck occurred during the recolonization process, and gene flow between the Apennines and the Alps was moderate (corresponding to 1.25-2.50 wolves per generation).
- Bottleneck simulations showed that a total of 8-16 effective founders explained the genetic diversity observed in the Alps.
- Therefore, the levels of genetic diversity in the current expanding alpine wolf population will depend on future successful migrants from the Apennines, and not only ….

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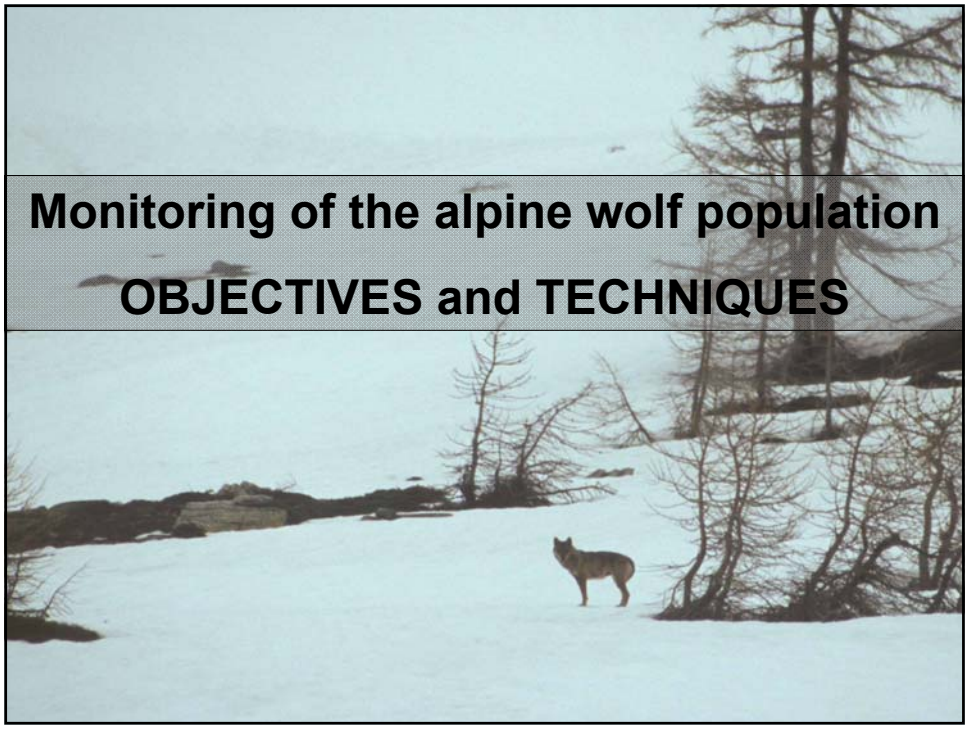


Assessing the conservation status of wolves in the Alps
THE MONITORING OBJECTIVES

1. Population size: - Number of packs
   - Number of wolves
2. Distribution: - Wolf occurrence
   - Wolf packs
3. Other population parameters (e.g. survival)

→ And the relative trends over time

Assessing the conservation status of wolves in the Alps
THE MONITORING TECHNIQUES

GOOD FOR INTENSIVE PREDATOR - PREY STUDY

GOOD FOR LARGE – SCALE POPULATION MONITORING

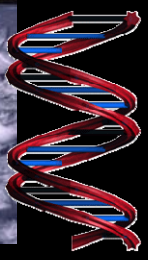
→ NON INVASIVE METHODS

THE NON-INVASIVE MONITORING TECHNIQUES

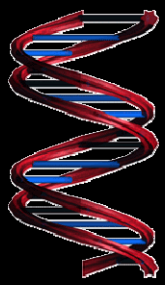
1 - Snow-tracking

2 – Genetic analysis on scat/tissue samples

3 – Wolf-howling



Genetic Analysis



Genetic Labs:

- FRANCE: LECA lab (Grenoble, FR)
- ITALY: USFS-RMRS Carnivore Genetic lab (Missoula, USA)
- SWISS: Lab for Conservation Biology (Losanna, CH)

MONITORING SAMPLING DESIGN

OVERALL APPROACH

- Extensive sign surveys at landscape scale to detect new wolf occurrence by a Network of trained wolf experts spatially dispatched
- Intensive sign survey to monitor each pack detected
- Molecular tracking

SPECIFIC APPROACH and OBJECTIVES by Country/Region + yearly modifications and improvements

E.g. Piemonte Region WINTER SAMPLING

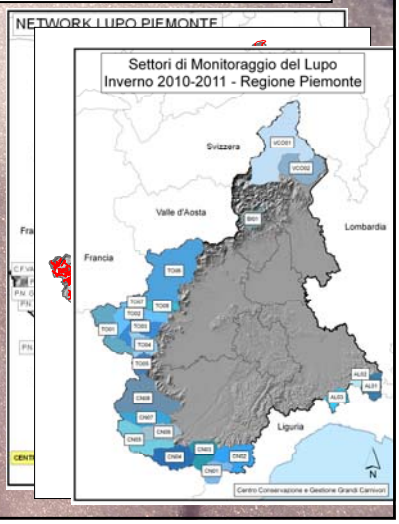
WOLF MONITORING NETWORK

Natural and National Parks

Corpo Forestale dello Stato

Polizia Provinciale

Comprensori Alpini



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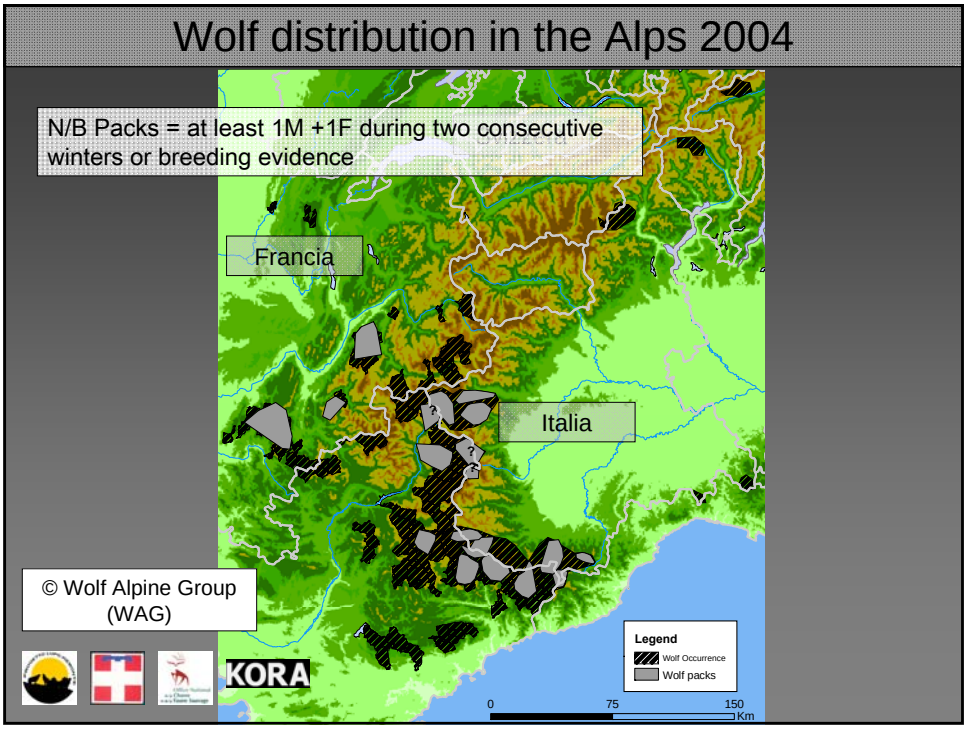
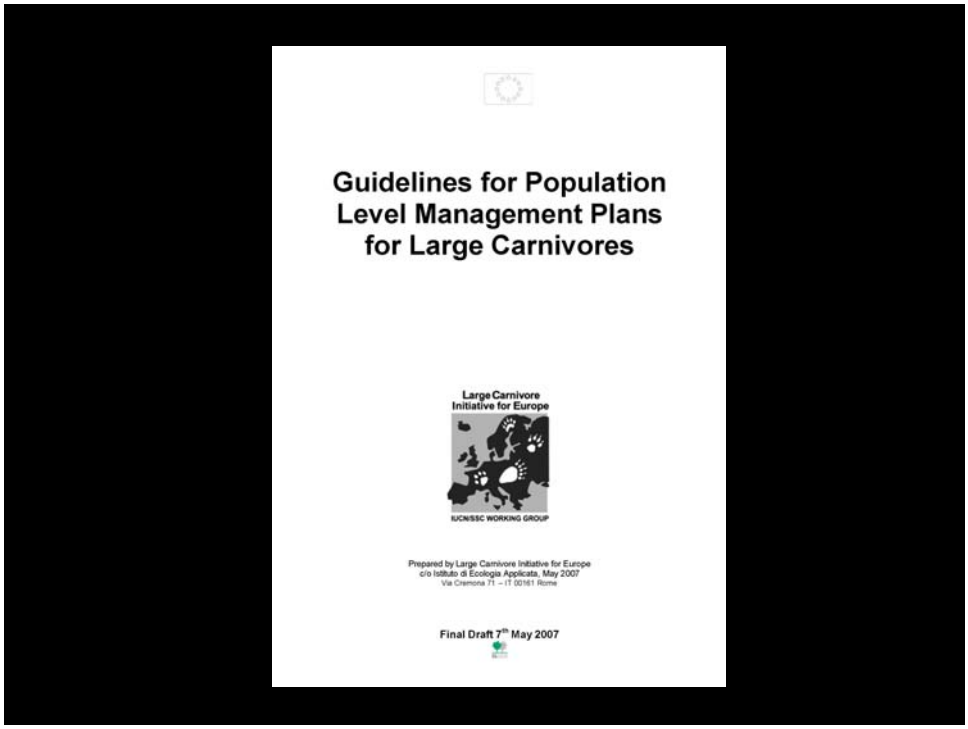
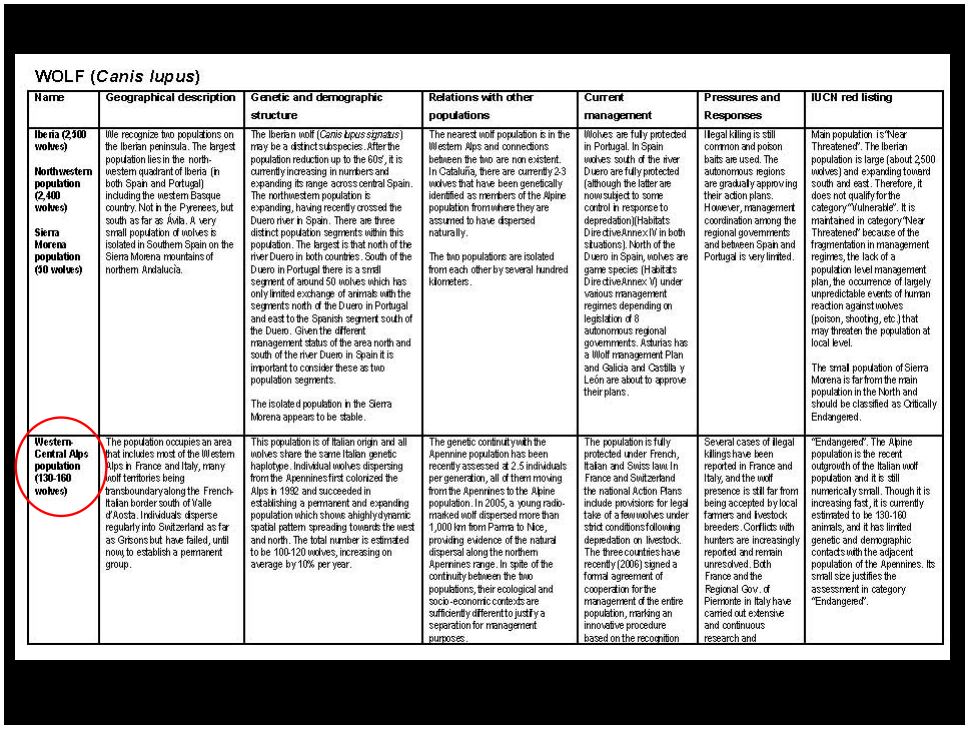
Wolf distribution in the Alps 2004







WOLF (*Canis lupus*)

Name	Geographical description	Genetic and demographic structure	Relations with other populations	Current management	Pressures and Responses	IUCN red listing
Iberia (2,500 wolves) **Northwestern population (2,400 wolves)** **Sierra Morena population (30 wolves)**	We recognize two populations on the Iberian peninsula. The largest population lies in the north-western quadrant of Iberia (in both Spain and Portugal) including the western Basque country. Not in the Pyrenees, but south as far as Avila. A very small population of wolves is isolated in Southern Spain on the Sierra Morena mountains of northern Andalucía.	The Iberian wolf (*Canis lupus signatus*) may be a distinct subspecies. After the population reduction up to the 60s', it is currently increasing in numbers and expanding its range across central Spain. The northwestern population is expanding, having recently crossed the Duero river in Spain. There are three distinct population segments within this population. The largest is that north of the river Duero in both countries. South of the Duero in Portugal there is a small segment of around 50 wolves which has only limited exchange of animals with the segments north of the Duero in Portugal and east to the Spanish segment south of the Duero. Given the different management status of the area north and south of the river Duero in Spain it is important to consider these as two population segments. The isolated population in the Sierra Morena appears to be stable.	The nearest wolf population is in the Western Alps and connections between the two are non existent. In Cataluña, there are currently 2-3 wolves that have been genetically identified as members of the Alpine population from where they are assumed to have dispersed naturally. The two populations are isolated from each other by several hundred kilometers.	Wolves are fully protected in Portugal. In Spain wolves south of the river Duero are fully protected (although the latter are now subject to some control in response to depredation)(Habitats Directive Annex IV in both situations). North of the Duero in Spain, wolves are game species (Habitats Directive Annex V) under various management regimes depending on legislation of 8 autonomous regional governments. Asturias has a Wolf management Plan and Galicia and Castilla y León are about to approve their plans.	Illegal killing is still common and poison baits are used. The autonomous regions are gradually approving their action plans. However, management coordination among the regional governments and between Spain and Portugal is very limited.	Main population is "Near Threatened". The Iberian population is large (about 2,500 wolves) and expanding toward south and east. Therefore, it does not qualify for the category "Vulnerable". It is maintained in category "Near Threatened" because of the fragmentation in management regimes, the lack of a population level management plan, the occurrence of largely unpredictable events of human reaction against wolves (poison, shooting, etc.) that may threaten the population at local level. The small population of Sierra Morena is far from the main population in the North and should be classified as Critically Endangered.
Western-Central Alps population (130-160 wolves)	The population occupies an area that includes most of the Western Alps in France and Italy, many wolf territories being transboundary along the French-Italian border south of Valle d'Aosta. Individuals disperse regularly into Switzerland as far as Grisons but have failed, until now, to establish a permanent group.	This population is of Italian origin and all wolves share the same Italian genetic haplotype. Individual wolves dispersing from the Apennines first colonized the Alps in 1992 and succeeded in establishing a permanent and expanding population which shows a highly dynamic spatial pattern spreading towards the west and north. The total number is estimated to be 100-120 wolves, increasing on average by 10% per year.	The genetic continuity with the Apennine population has been recently assessed at 2.5 individuals per generation, all of them moving from the Apennines to the Alpine population. In 2005, a young radio-marked wolf dispersed more than 1,000 km from Parma to Nice, providing evidence of the natural dispersal along the northern Apennines range. In spite of the continuity between the two populations, their ecological and socio-economic contexts are sufficiently different to justify a separation for management purposes.	The population is fully protected under French, Italian and Swiss law. In France and Switzerland the national Action Plans include provisions for legal take of a few wolves under strict conditions following depredation on livestock. The three countries have recently (2006) signed a formal agreement of cooperation for the management of the entire population, marking an innovative procedure based on the recognition	Several cases of illegal killings have been reported in France and Italy, and the wolf presence is still far from being accepted by local farmers and livestock breeders. Conflicts with hunters are increasingly reported and remain unresolved. Both France and the Regional Gov. of Piemonte in Italy have carried out extensive and continuous research and	"Endangered". The Alpine population is the recent outgrowth of the Italian wolf population and it is still numerically small. Though it is increasing fast, it is currently estimated to be 130-160 animals, and it has limited genetic and demographic contacts with the adjacent population of the Apennines. Its small size justifies the assessment in category "Endangered".

Protocollo di collaborazione italo-franco-svizzera per la gestione del lupo nelle Alpi

Protocole de collaboration italo-franco-suisse pour la gestion du loup dans les Alpes

Premesso che:

- La Raccomandazione del Comitato permanente della Convenzione di Berna n. 62 del 2000, richiamando la Raccomandazione n. 74 del 1999, raccomanda alle Parti contraenti una serie di azioni specifiche per la conservazione dei grandi carnivori, tra cui, specificamente rivolte a Francia, Italia e Svizzera (Lupo nelle Alpi occidentali) le seguenti:
  - riconoscere, ai fini della gestione, la popolazione del lupo alpino come una entità geograficamente distinta;
  - collaborare per una gestione congiunta della popolazione di lupo alpino, stabilendo adeguate strutture e contatti tecnici e politici;
  - favorire il mantenimento della popolazione di lupo alpino in un buono stato di conservazione nel quadro di uno sviluppo sostenibile delle aree rurali;
- Nel corso della sua 24a sessione, tenutasi a Strasburgo dal 30 novembre al 4 dicembre 2004, il Comitato permanente della Convenzione di Berna ha deciso, in riferimento alla richiesta della Svizzera di declassare il lupo (*Canis lupus*) dall'allegato II all'allegato III della Convenzione, di "rinviare la discussione sulla proposta svizzera a un prossimo incontro e di preparare il rapporto summenzionato", approvando tra l'altro la proposta dei Paesi dell'UE di condurre uno studio scientifico sulle dimensioni e sulla distribuzione delle popolazioni europee di lupo nonché sulle minacce a cui sono esposte.

Considérant que:

- La Recommandation du comité permanent de la Convention de Berne n° 62 de 2000, se référant à la Recommandation n° 74 de 1999, demande aux Parties contractantes de prendre des mesures spécifiques pour la conservation des grands carnivores, et que, parmi celles-ci, les mesures suivantes concernent spécifiquement la France, l'Italie et la Suisse (loup dans les Alpes occidentales):
  - reconnaître, en ce qui concerne la gestion, la population de loups alpins comme une entité distincte;
  - collaborer en vue d'une gestion conjointe de la population de loups alpins en établissant des structures adéquates et des contacts techniques et politiques;
  - favoriser le maintien de la population de loups alpins dans un bon état de conservation, dans le cadre du développement durable des zones rurales.
- Au cours de sa 24e session qui a eu lieu à Strasbourg du 30 novembre au 4 décembre 2004, le comité permanent de la Convention de Berne a convenu – en se référant à la demande de la Suisse de déclasser le loup (*Canis lupus*) de l'Annexe II à l'Annexe III de la Convention – de "renvoyer la discussion sur la proposition suisse à une rencontre ultérieure et de préparer le rapport susmentionné", approuvant entre autres la proposition des pays de l'UE de mener une étude scientifique sur les dimensions et la distribution des populations européennes de loups ainsi que sur les menaces qui pèsent sur elles.

Two complementary « entities »

- The Wolf Alpine Group (WAG; 2001-)
- Biologists from concerned countries (I, CH, F)
- Exchange data about population status
- Improve standardization of methods used to monitor wolves
- …etc.

- The Permanent Committee for the management of wolves in the Alps (2006-)
- gov. representatives from I, CH, F.
- promote the coordination of management strategies
- implement expert groups to deal with monitoring of wolves and with livestock-related issues.

Assessing the conservation status of wolves in the western Alps

1- how to define the wolf alpine population ?

2 - how to evaluate the conservation status from an operational point of view ?

1a – defining the geographical boundaries: biology and politics
1b –demographic vs. genetic point of view: a matter of scale

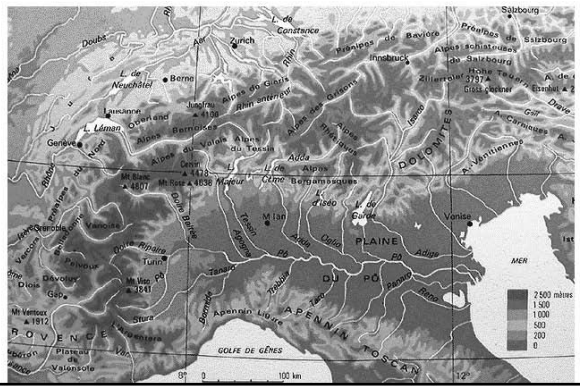
2a – a yearly map of packs + wolf occurrence
2b – an index of changes over years in the no. of packs.
2c – description of each wolf territory (lone individual; pack; transboundary; breeding ..etc.)

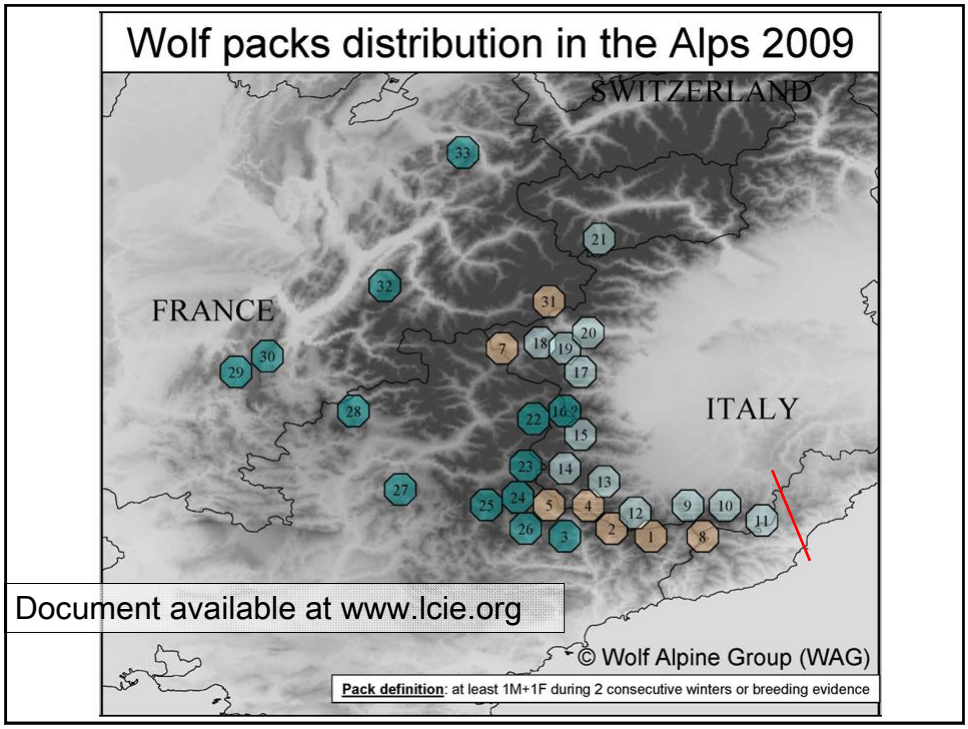
Technical group for wolf monitoring and research in the western Alps

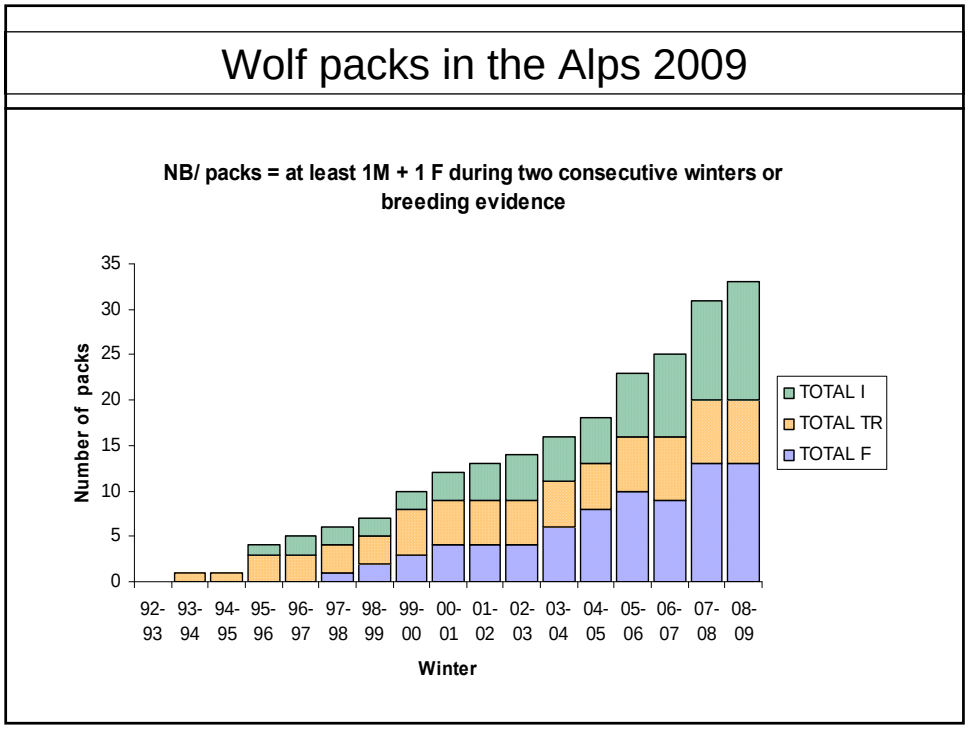
First report to the Permanent Committee:

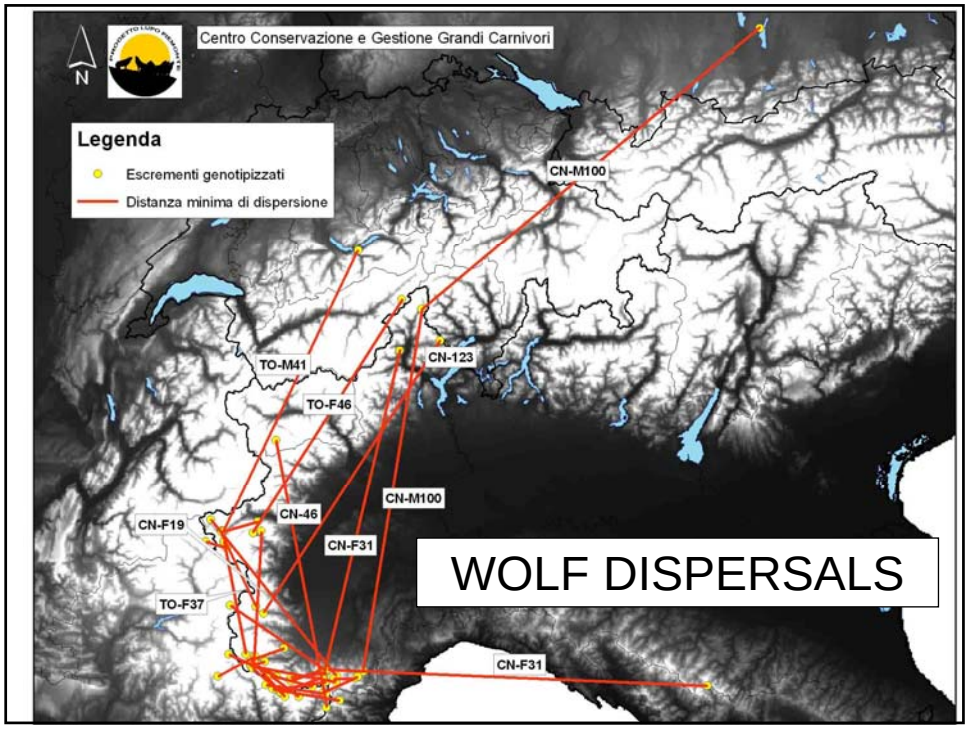
Wolves in the western Alps:

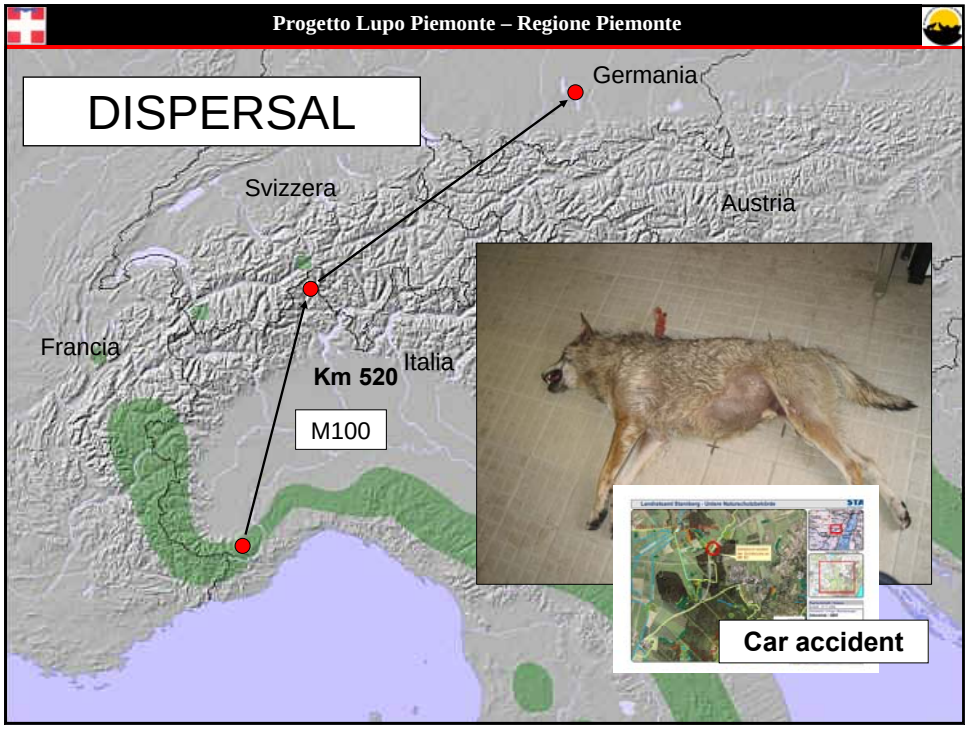
Monitoring and Conservation Status

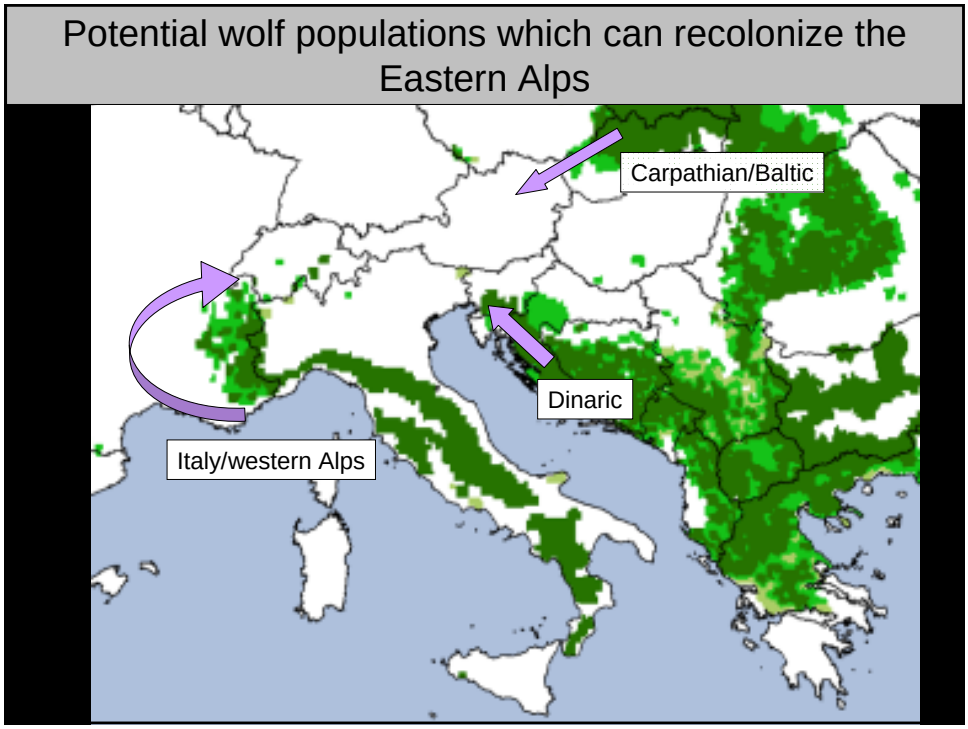


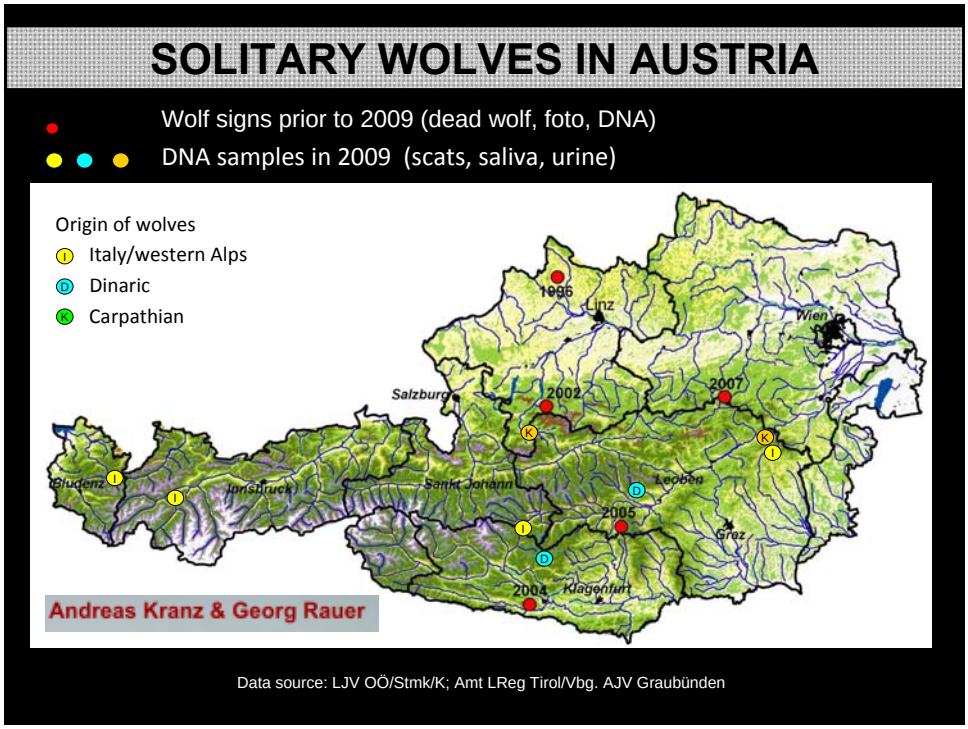

Wolf packs distribution in the Alps 2009
SWITZERLAND
FRANCE
ITALY
Document available at www.lcie.org
© Wolf Alpine Group (WAG)
Pack definition: at least 1M+1F during 2 consecutive winters or breeding evidence

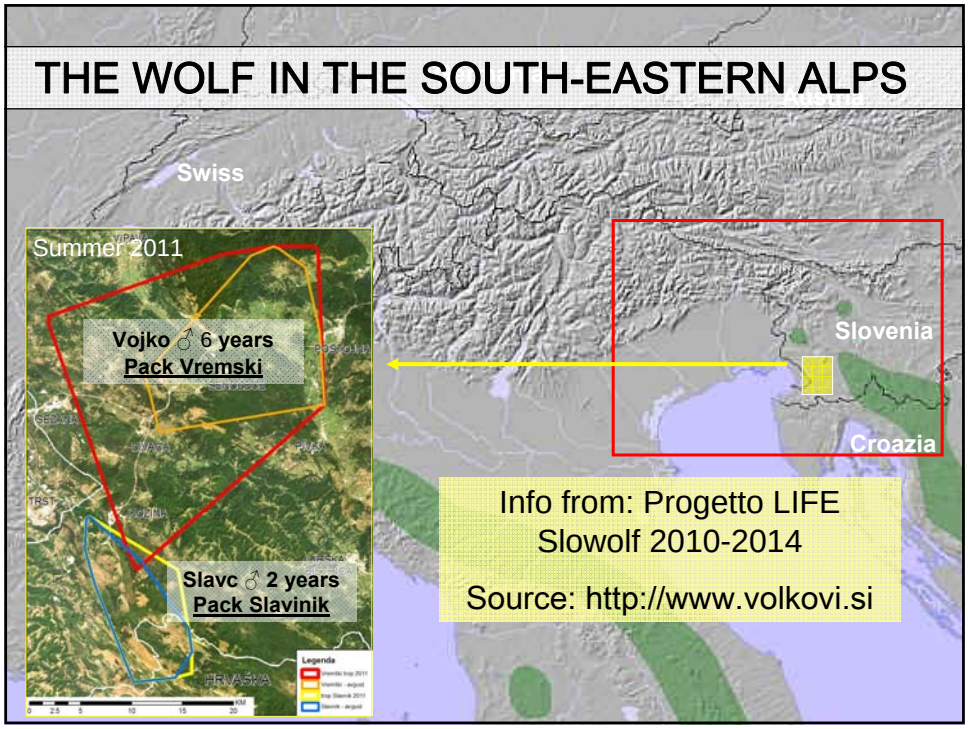

Wolf packs in the Alps 2009
NB/ packs = at least 1M + 1 F during two consecutive winters or breeding evidence
Number of packs
Winter
TOTAL I
TOTAL TR
TOTAL F
92-93
93-94
94-95
95-96
96-97
97-98
98-99
99-00
00-01
01-02
02-03
03-04
04-05
05-06
06-07
07-08
08-09

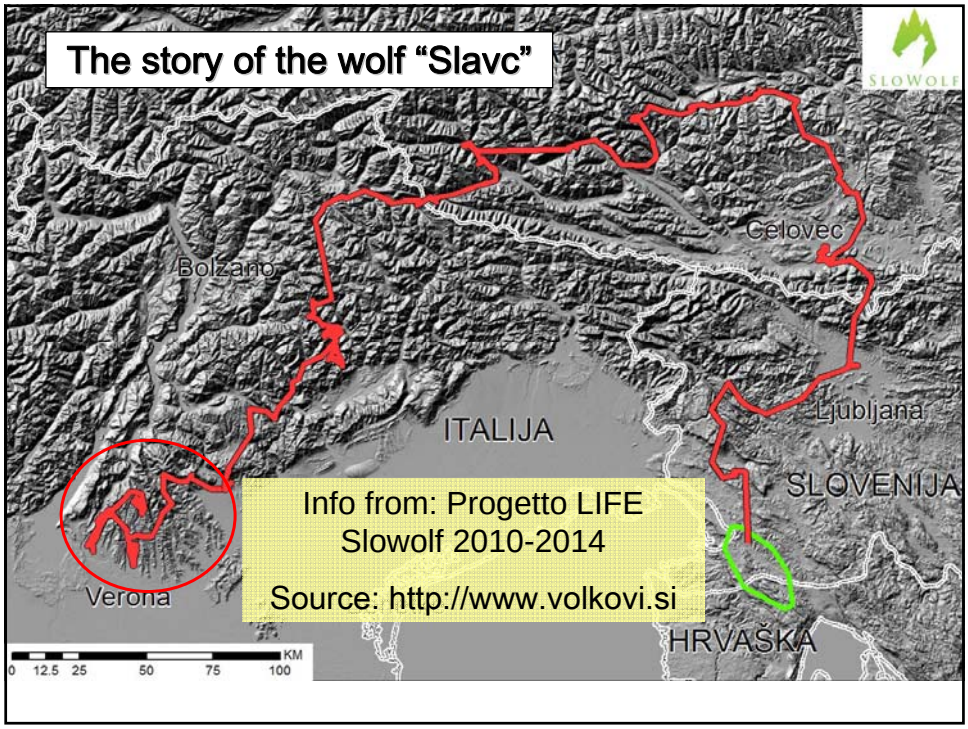

Centro Conservazione e Gestione Grandi Carnivori
N
Legenda
Escrementi genotipizzati
Distanza minima di dispersione
CN-M100
TO-M41
CN-123
TO-F46
CN-M100
CN-46
CN-F19
CN-F31
TO-F37
CN-F31
WOLF DISPERSALS

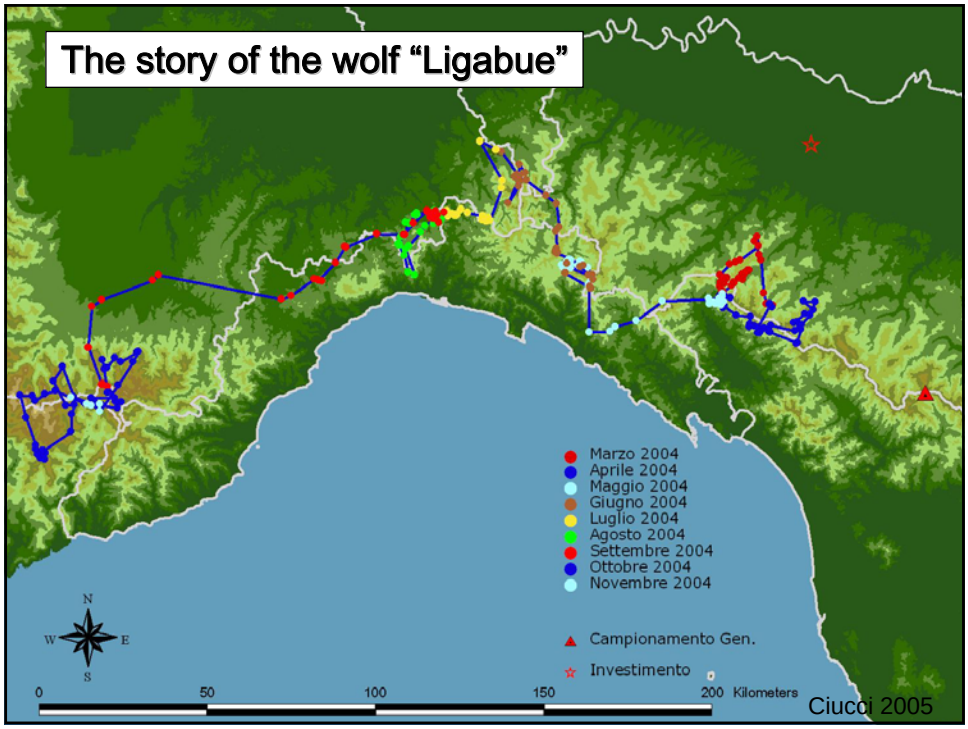

Progetto Lupo Piemonte – Regione Piemonte
DISPERSAL
Germania
Svizzera
Austria
Francia
Italia
Km 520
M100
Car accident

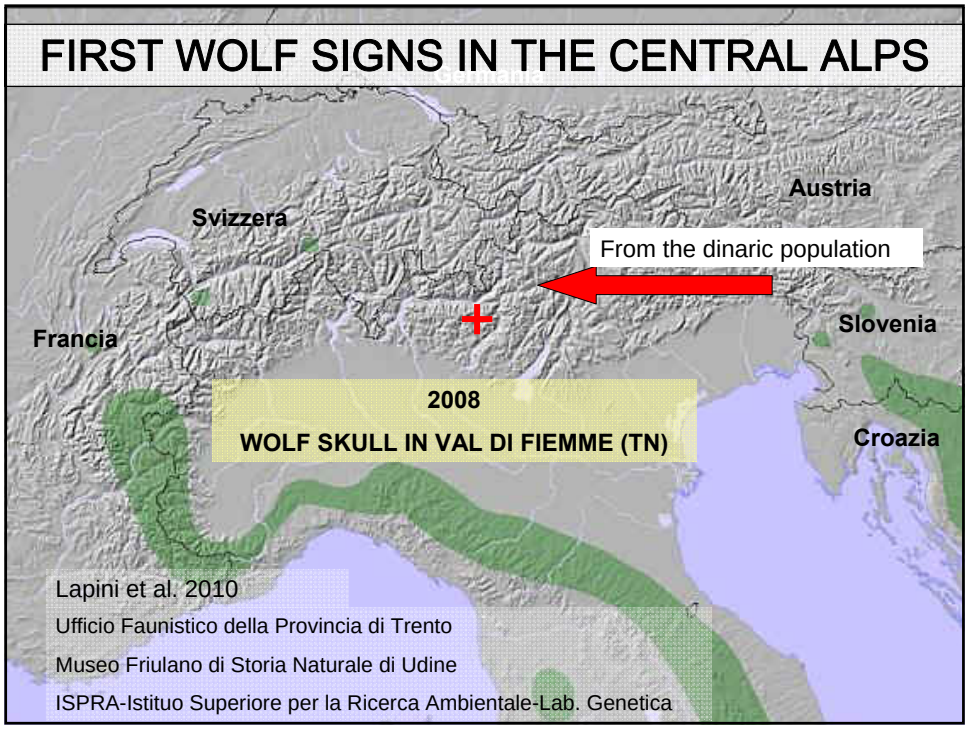

Potential wolf populations which can recolonize the Eastern Alps
Carpathian/Baltic
Dinaric
Italy/western Alps

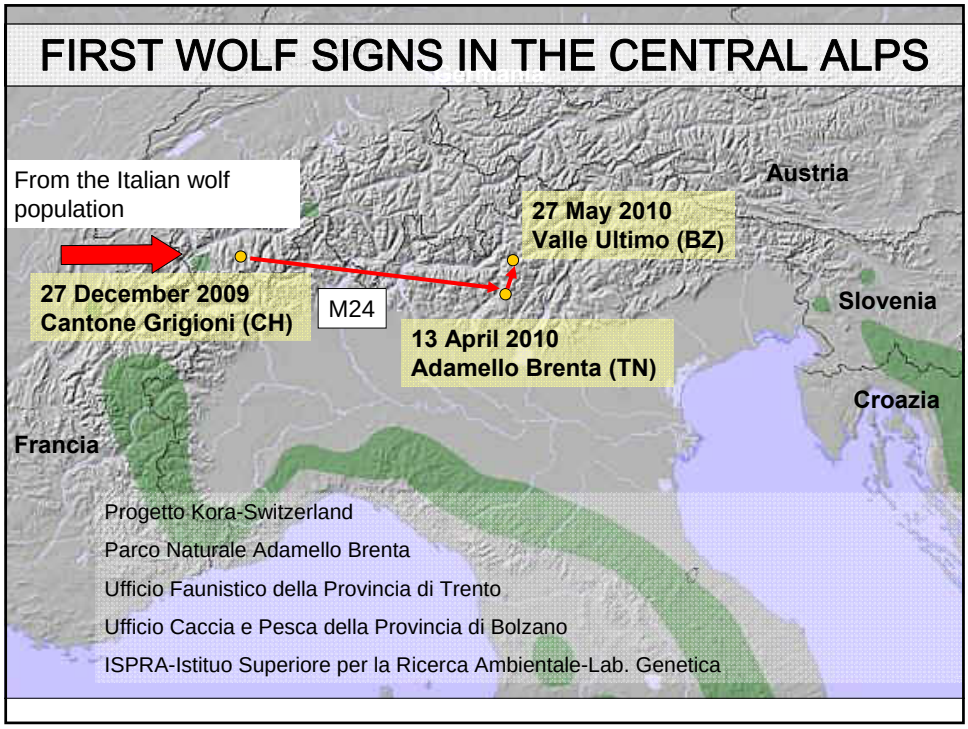

SOLITARY WOLVES IN AUSTRIA
Wolf signs prior to 2009 (dead wolf, foto, DNA)
DNA samples in 2009 (scats, saliva, urine)
Origin of wolves
I Italy/western Alps
D Dinaric
K Carpathian
1996
Linz
Wien
Salzburg
2002
2007
Bludenz
Innsbruck
Sankt Johann
Leoben
2005
Graz
2004
Klagenfurt
Andreas Kranz & Georg Rauer
Data source: LJV OÖ/Stmk/K; Amt LReg Tirol/Vbg. AJV Graubünden

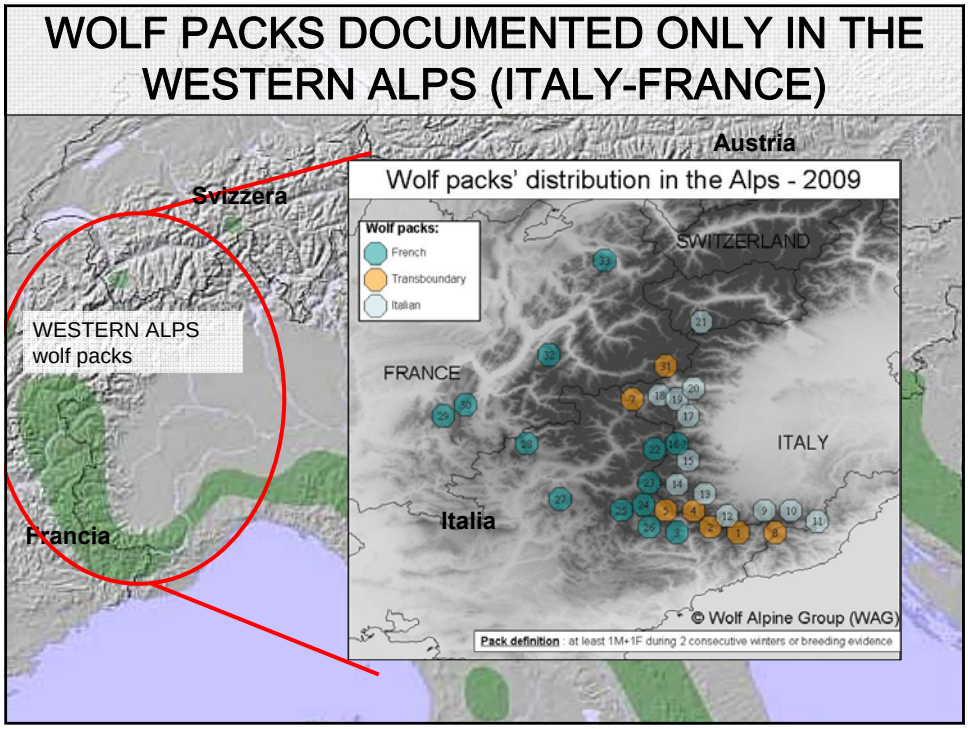

THE WOLF IN THE SOUTH-EASTERN ALPS
Swiss
Summer 2011
Vojko ♂ 6 years
Pack Vremski
Slavc ♂ 2 years
Pack Slavinik
Slovenia
Croazia
Info from: Progetto LIFE
Slowolf 2010-2014
Source: http://www.volkovi.si

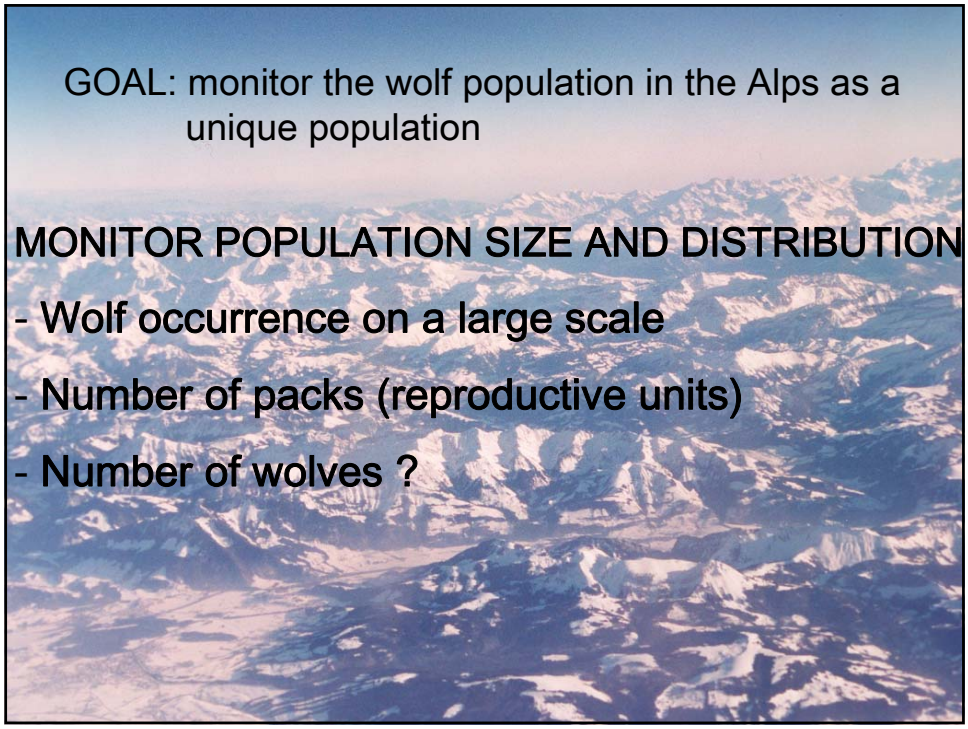

The story of the wolf "Slavc"
Celovec
Bolzano
ITALIJA
Ljubljana
SLOVENIJA
Info from: Progetto LIFE
Slowolf 2010-2014
Source: http://www.volkovi.si
Verona
HRVAŠKA
KM
0 12.5 25 50 75 100

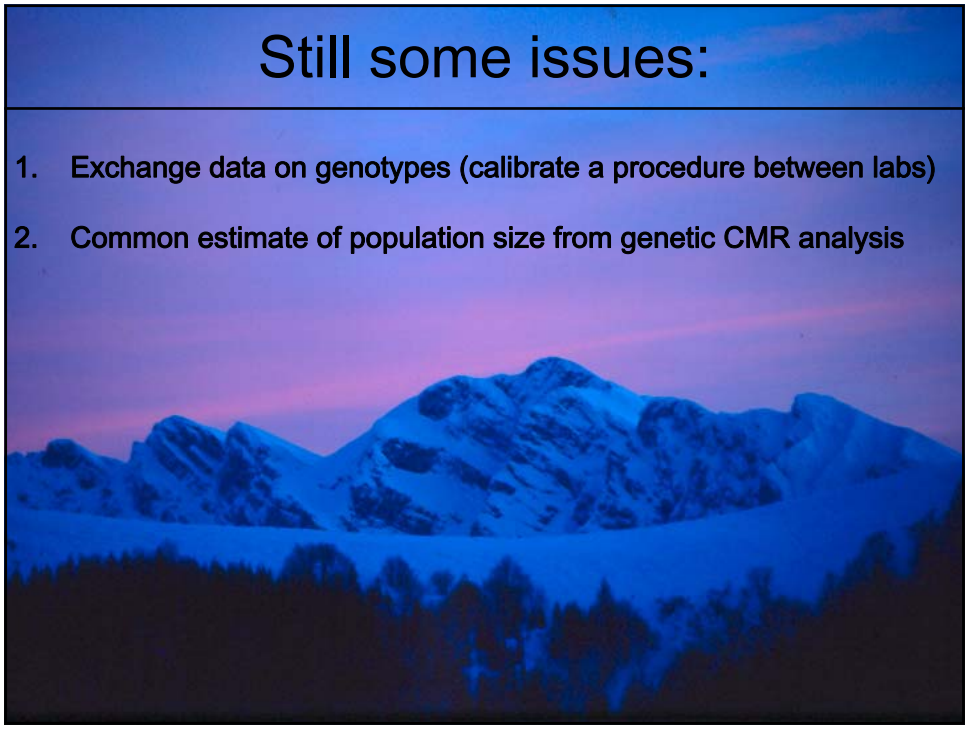

The story of the wolf “Ligabue”
Marzo 2004
Aprile 2004
Maggio 2004
Giugno 2004
Luglio 2004
Agosto 2004
Settembre 2004
Ottobre 2004
Novembre 2004
Campionamento Gen.
Investimento
N
W
E
S
0
50
100
150
200 Kilometers
Ciucci 2005


FIRST WOLF SIGNS IN THE CENTRAL ALPS
Svizzera
Austria
From the dinaric population
Francia
Slovenia
2008
WOLF SKULL IN VAL DI FIEMME (TN)
Croazia
Lapini et al. 2010
Ufficio Faunistico della Provincia di Trento
Museo Friulano di Storia Naturale di Udine
ISPRA-Istituo Superiore per la Ricerca Ambientale-Lab. Genetica


FIRST WOLF SIGNS IN THE CENTRAL ALPS
From the Italian wolf population
27 December 2009
Cantone Grigioni (CH)
M24
27 May 2010
Valle Ultimo (BZ)
13 April 2010
Adamello Brenta (TN)
Austria
Slovenia
Croazia
Francia
Progetto Kora-Switzerland
Parco Naturale Adamello Brenta
Ufficio Faunistico della Provincia di Trento
Ufficio Caccia e Pesca della Provincia di Bolzano
ISPRA-Istituo Superiore per la Ricerca Ambientale-Lab. Genetica


WOLF PACKS DOCUMENTED ONLY IN THE WESTERN ALPS (ITALY-FRANCE)
Austria
Svizzera
WESTERN ALPS
wolf packs
Francia
Italia
Wolf packs' distribution in the Alps - 2009
Wolf packs:
French
Transboundary
Italian
SWITZERLAND
FRANCE
ITALY
© Wolf Alpine Group (WAG)
Pack definition : at least 1M+1F during 2 consecutive winters or breeding evidence


GOAL: monitor the wolf population in the Alps as a unique population
MONITOR POPULATION SIZE AND DISTRIBUTION
- Wolf occurrence on a large scale
- Number of packs (reproductive units)
- Number of wolves ?


Still some issues:
1. Exchange data on genotypes (calibrate a procedure between labs)
2. Common estimate of population size from genetic CMR analysis

Still some issues:

1. **Exchange data on genotypes (calibrate a procedure between labs)**

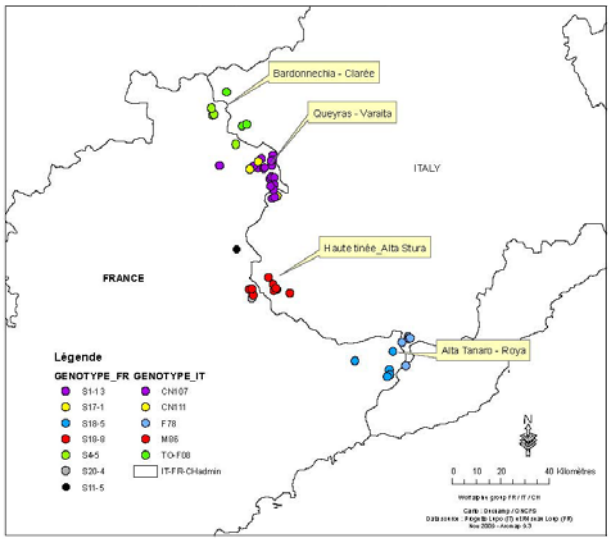
↓

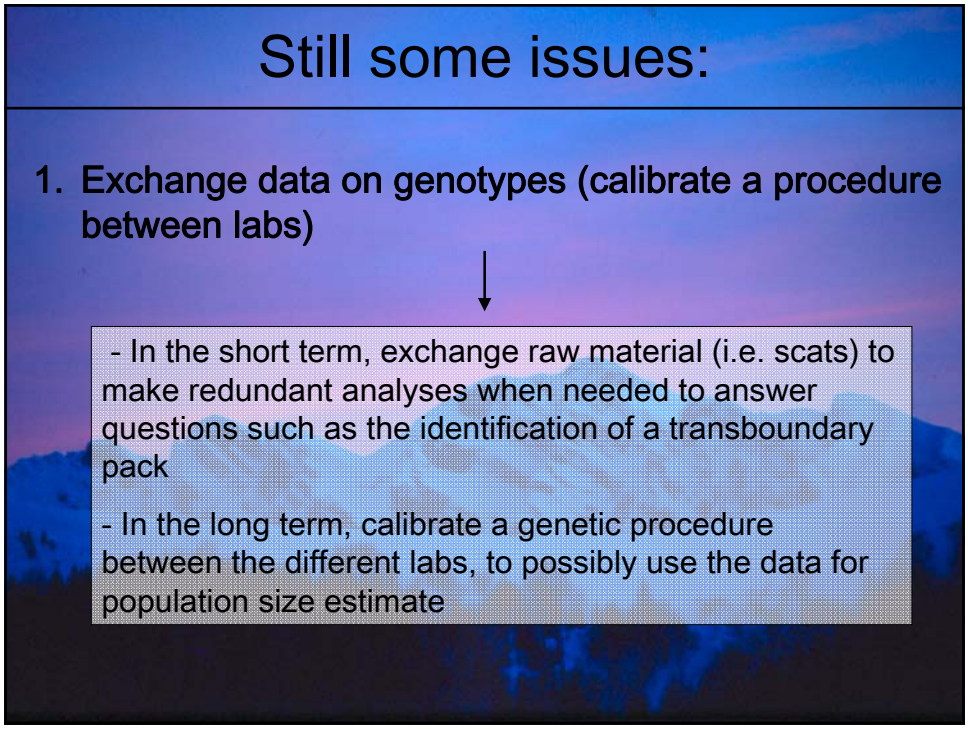
- In the short term, exchange raw material (i.e. scats) to make redundant analyses when needed to answer questions such as the identification of a transboundary pack

- In the long term, calibrate a genetic procedure between the different labs, to possibly use the data for population size estimate

Transboundary packs highlighted by cross validation in genetic analysis between FR and IT

(see QDN letter N°22 – example of year 2006)

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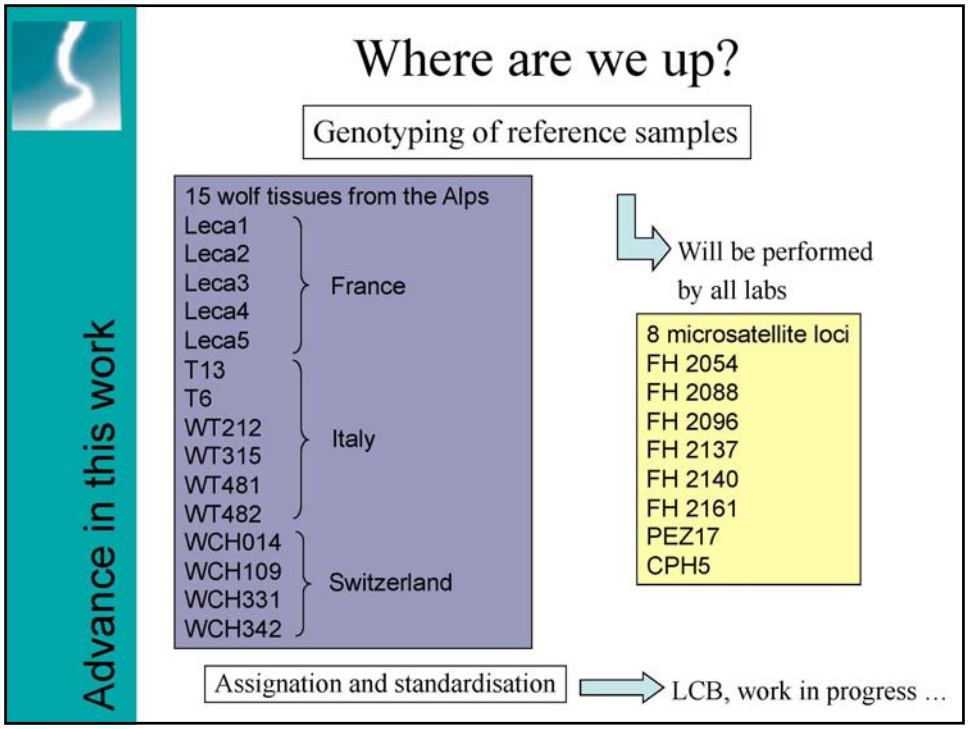
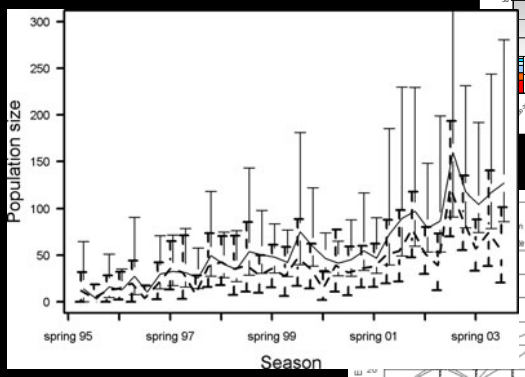
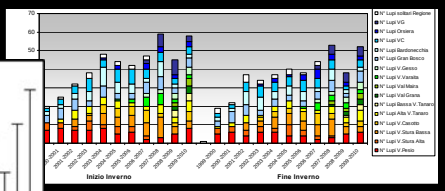

Advance in this work
Where are we up?
Genotyping of reference samples
15 wolf tissues from the Alps
Leca1
Leca2
Leca3
Leca4
Leca5
France
T13
T6
WT212
WT315
WT481
WT482
Italy
WCH014
WCH109
WCH331
WCH342
Switzerland
Will be performed by all labs
8 microsatellite loci
FH 2054
FH 2088
FH 2096
FH 2137
FH 2140
FH 2161
PEZ17
CPH5
Assignation and standardisation
LCB, work in progress …

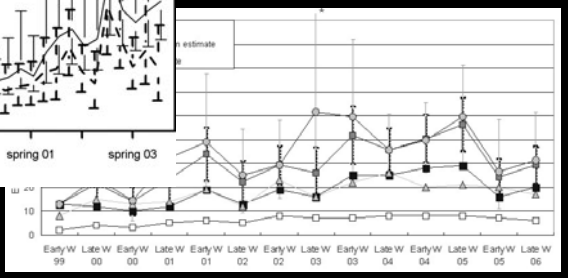
2. Common estimate of population size

Which one is the best method to estimate the wolf population?



Cubaynes et al. 2010 Conservaztion Biology





Marucco et al. 2009 Journal of Applied Ecology

LESSON LEARNED

- If the goal is to monitor the wolf population in the Alps as a unique population, we should focus on estimating pack numbers and distribution over the years, more than population size, because a common robust CR estimate of population size is hard and expensive to obtain given the difficulties in calibrating the datasets in between different genetic labs.
- Pitfalls should be considered in designing sampling and lab protocols to minimize errors.
- Defining wolf occurrence over the boundaries will also need an assessment of standards for data mapping.


THANKS