



EUROPARC
FEDERATION



Seminar-Dialogue with DG Environment 2019

Carrying Capacity Assessment: overview & tools

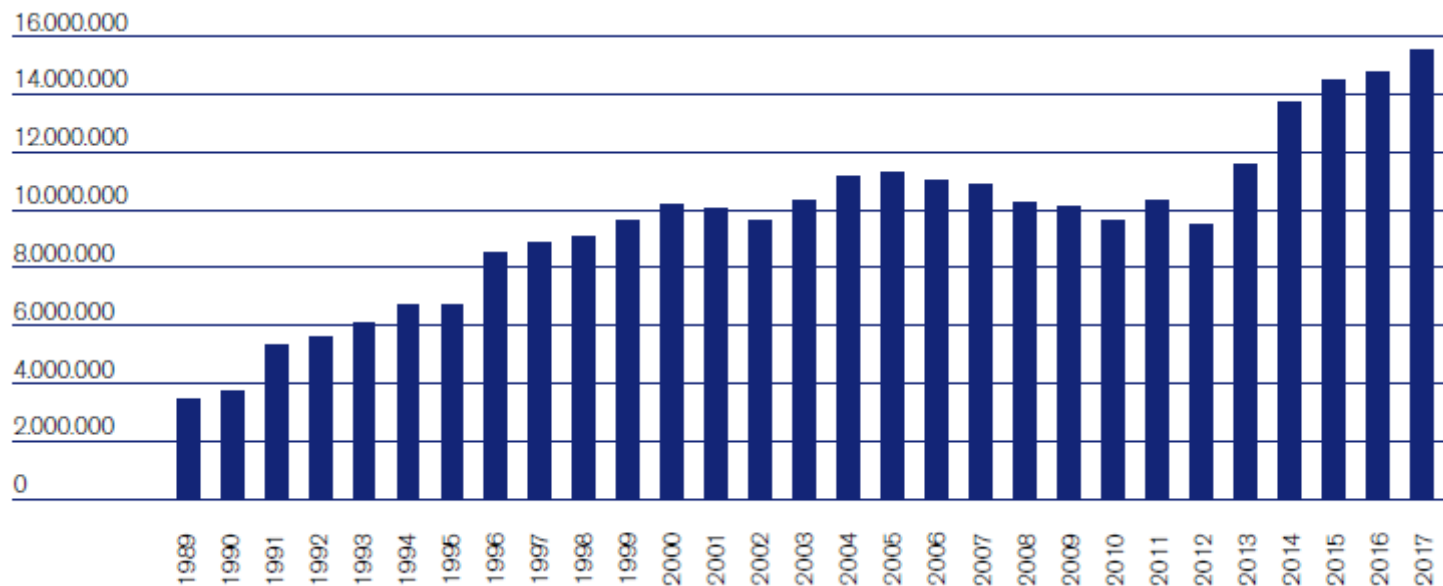
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PARA LOS ESPACIOS NATURALES

RECREATION IN NATURAL AREAS

Evolution of visitors per year in Spanish National Parks



Source: *EUROPARC-Spain (2017)*

RECREATION IN NATURAL AREAS

SAC ES2130005 – San Juan de Gaztelugatxe

158 has. (26,8 has. terrestre)

Max. 6,000
visitors in a
day !!!



Total monthly visitation - San Juan de Gaztelugatxe (2018)



Source: naiz.eus

RADIO BILBAO

HORA 14 BIZKAIA

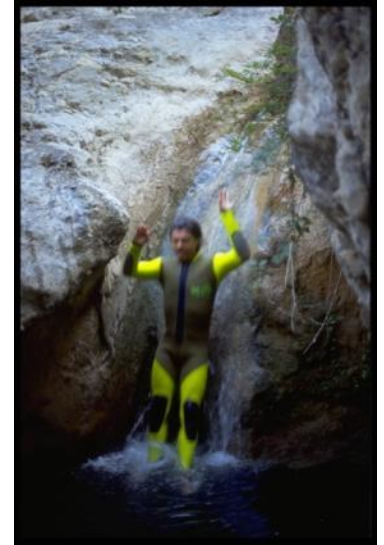
SAN JUAN DE GAZTELUGATXE

El problema de San Juan de Gaztelugatxe con el robo masivo de sus piedras

"Nos están robando las piedras", cuenta Juan Barturen, miembro de la Comisión de Voluntarios de San Juan de Gaztelugatxe

Source: cadeneras.es

RECREATION/TOURISM/SPORT ACTIVITIES IN NATURE





RECREATION IN NATURAL AREAS

- Continuously rising: high demand & offer
- Searching for quality areas (“deep into the forest/mountain/sea”): high capacity to go deep into Nature and impact where other land uses cannot.
- Local/rural development expectations through tourism initiatives.
- A good opportunity for environmental education: All recreation activities in protected areas should include some environmental education contents?

RECREATION IMPACTS

Erosion



Damages on
geological heritage



RECREATION IMPACTS

Root exposure



Habitat loss



Trampling/recolection of endangered species



RECREATION IMPACTS



Trampling/outrage

Breeding failure



Feeding



RECREATION IMPACTS

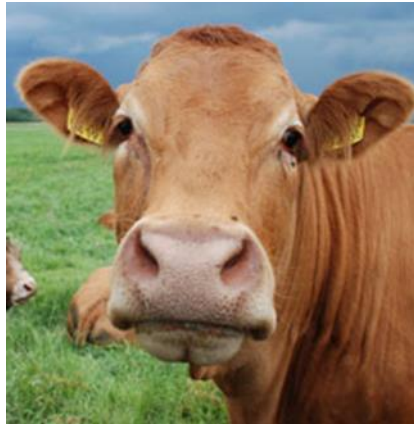


Garbage

Fire risk



FROM CATTLE TO VISITORS...



CARRYING CAPACITY: HISTORY AND CONCEPTS

- Carrying capacity
- Recreation Ecology
- Disturbance research (fauna)

Table 2—The development and major events of recreation ecology research.^a

Approximate time period	Development/event(s)
1990s	Refinement of methods; new topics and perspectives
1980s	Integration with management frameworks
1970s	Period of active research
1960s	Period of rapidly increasing use and impact
1940-50s	First scientific studies in the United States
1930s	First experimental trampling studies in the United Kingdom
1920s	Early observations and descriptions of the problem

^aPartly based on Cole (1987b).

Source: *Leung & Marion (2000)*



CARRYING CAPACITY: HISTORY AND CONCEPTS

Points of agreement:

- Recreation carrying capacity is not an inherent value; it must reflect value judgments.
- Use limits (“*numbers*”) are means rather than ends: they represent the limits that must be set in order to maintain specified acceptable conditions.
- Decisions must be made about which recreation users and which experiences should be favored in any given place.
- Managers need to make use limitation decisions within the context of a large system perspective.
- Little research taking a regional perspective has been conducted.

Source: Cole (2001)



FROM THEORY TO PRACTICE...

- It's important not to be lost with concepts and frameworks. Previous points of agreement displayed are the basic key.
- Keep in mind that most of these approaches were designed in USA. Nature, protected areas systems and visitors profiles are different in European countries and European biogeographical regions: Local approaches are needed.
- In addition, carrying capacity studies are good opportunities in a protected area :
 - To know the number, flow and profiles of visitors.
 - To know the most sensible biotic & abiotic elements to recreational activities and their responses to them.

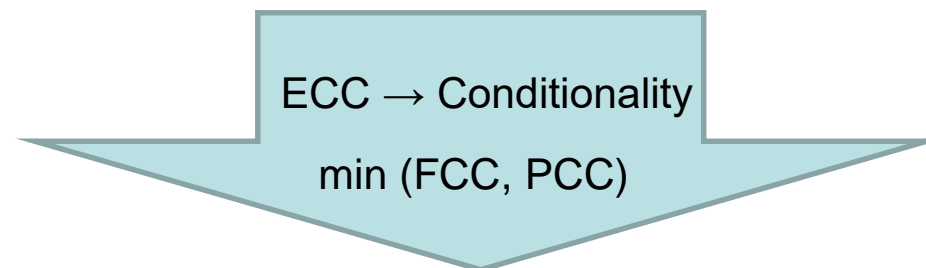


FROM THEORY TO PRACTICE...

CARRYING CAPACITY:

Maximum visitor level that an area can hold with no impact / the least environmental impact level and the best experience quality for visitors.

- Physical carrying capacity (FCC)
- Ecological carrying capacity (ECC)
- Social/Psychological carrying capacity (PCC)



GLOBAL CARRYING CAPACITY VALUE

PHYSICAL CARRYING CAPACITY

- Maximum visitor level that an area can physically hold, related to their public use facilities and services (visitor centers, parkings, trails, recreational areas, beaches...).
- Keep in mind that some facilities and services are linked (e.g. parking areas that surround a visitor center, a trail or a beach).
- For trails, it's interesting the approach of Cifuentes et al. (1992, 1999):

$$\sum \left(\frac{DT}{DG} \frac{TT}{TV} \right) PG$$

DT: Total trail length

DG: Average/optimal distance between visitor groups

TT: Daily visit time

TV: Average visit duration

PG: Average num. of visitors per group





ECOLOGICAL CARRYING CAPACITY

- Maximum visitor level without critical or irreversible environmental impacts.
- What is a critical/irreversible impact?:
 - Legal framework
 - Conservation objectives: management plans
 - Scientific/expert criteria
- In general, the result of ECC could be: ACCEPTABLE, ACCEPTABLE WITH CONDITIONS (some management actions must be applied) or NO ACCEPTABLE.
- In nature, it's difficult to find clear relationship between visitor intensity and environmental impact level at some areas (i.e. wildlife disturbance). Local studies are required.

ECOLOGICAL CARRYING CAPACITY

- Studies addressed to know better these impacts are essential to run more reliable management measures.

Prediction model of breeding vultures response from visitor activity (CATREG) in Bardenas Reales Natural Park.

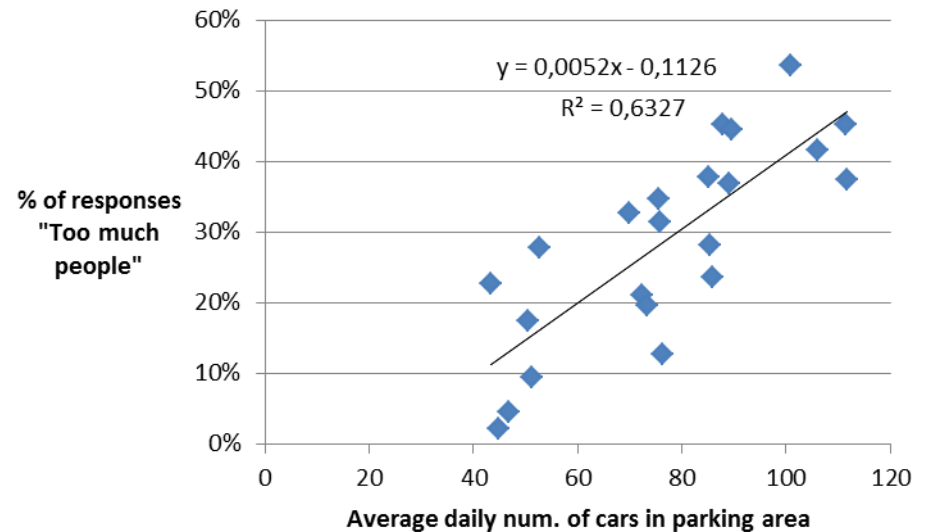
	Standarized coefficients		fd	F	Sig.
	Beta	Standard error estimation			
Traffic intensity	-,001	,164	1	,000	,996
Num. visitors/group	,225	,163	1	1,903	,174
Visitor behaviour	,141	,170	2	,685	,509
Distance from breeding colony	,512	,189	3	7,355	,000
Num. of cars parked	,532	,229	1	5,392	,024
Hour of the day	,550	,162	13	11,558	,000

Source: www.bardenasreales.es



SOCIAL/PSYCHOLOGICAL CARRYING CAPACITY

- Maximum visitor level previous to feel significant crowd level and dissatisfaction.
- How to get it?: correlation between visitor intensity and crowd level



- Crowd level finding through surveys

MANAGEMENT MEASURES

I. Reduce use of the entire area

- Limit number of visitors in the entire area
- Limit length of stay in the entire area
- Encourage use of other areas
- Require certain skills and/or equipment
- Charge a flat visitor fee
- Make access more difficult throughout the entire area

II. Reduce use of problem areas

- Inform potential visitors of the disadvantages of problem areas and/or advantages of alternative areas
- Discourage or prohibit use of problem areas
- Limit number of visitors in problem areas
- Encourage or require a length-of-stay limit in problem areas
- Make access to problem areas more difficult and/or improve access to alternative areas
- Eliminate facilities or attractions in problem areas and/or improve facilities or attractions in alternative areas
- Establish differential skill and/or equipment requirements
- Charge differential visitor fees

III. Modify the location of use within problem areas

- Discourage or prohibit camping and/or stock use on certain campsites and/or locations
- Encourage or permit camping and/or stock use only on certain campsites and/or locations
- Locate facilities on durable sites
- Concentrate use on sites through facility design and/or information
- Discourage or prohibit off-trail travel
- Segregate different types of visitors

IV. Modify the timing of use

- Encourage use outside of peak use periods
- Discourage or prohibit use when impact potential is high
- Charge fees during periods of high use and/or high-impact potential

V. Modify type of use and visitor behavior

- Discourage or prohibit particularly damaging practices and/or equipment
- Encourage or require certain behavior, skills and/or equipment
- Teach a wilderness ethic
- Encourage or require a party size and/or stock limit
- Discourage or prohibit stock
- Discourage or prohibit pets
- Discourage or prohibit overnight use

VI. Modify visitor expectations

- Inform visitors about appropriate uses
- Inform visitors about conditions they may encounter

VII. Increase the resistance of the resource

- Shield the site from impact
- Strengthen the site

VIII. Maintain or rehabilitate the resource

- Remove problems
- Maintain or rehabilitate impacted locations

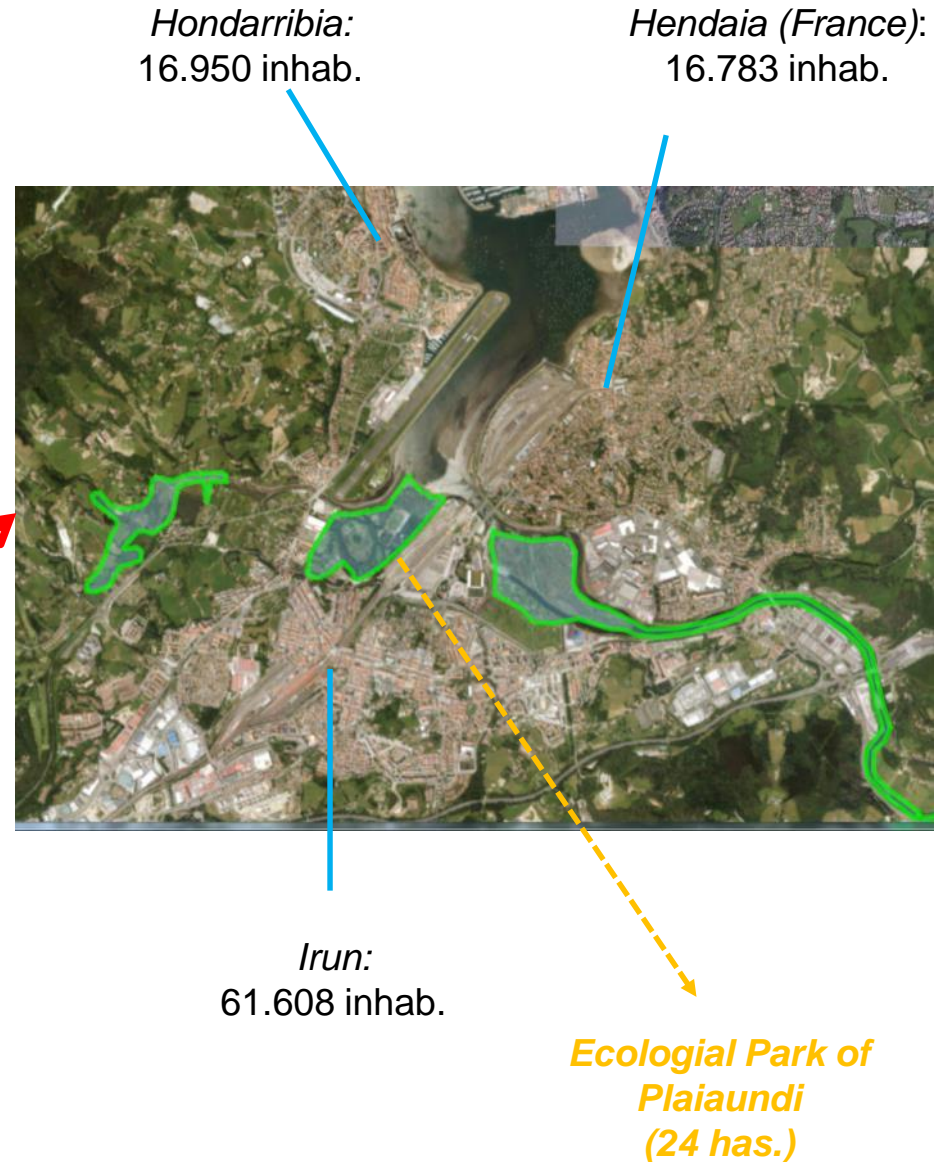
Source: Cole and others (1987).

Source: *Cole et al. (1987)*

AN EXAMPLE: A PERIURBAN PARK IN THE BASQUE COUNTRY

Protected Area of Txingudi (Gipuzkoa, Spain)

- 160, 82 has.
- SAC ES2120018 Txingudi-Bidasoa
- SPA ES0000243 Txingudi
- Ramsar wetland



AN EXAMPLE: A PERIURBAN PARK IN THE BASQUE COUNTRY

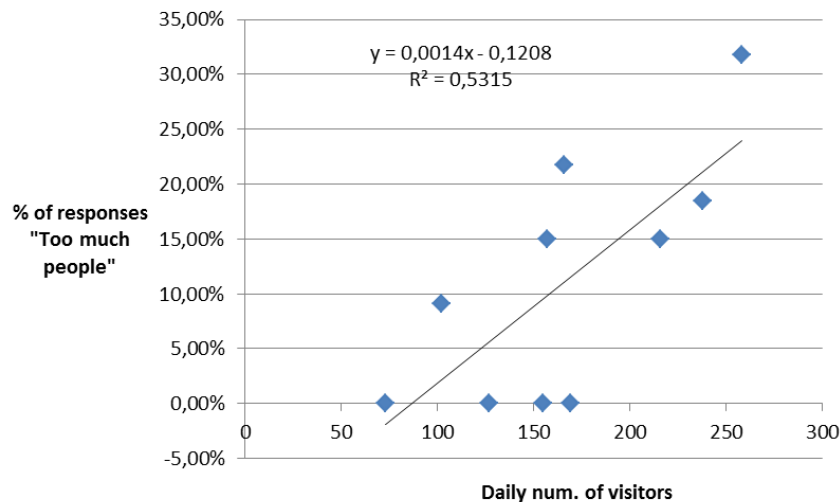
Ecological Park of Plaiaundi

- International importance for bird migration
- 7 habitats of Directive 92/43/CEE
- 35.000 visitors/year
- Visitor center / recreative area
- Birdwatching observatories
- Trails
- Parking area
- Sports center (relocation pending)



AN EXAMPLE: A PERIURBAN PARK IN THE BASQUE COUNTRY

- Physical (applying Cifuentes method to trails): 905 visitors/day
- Ecological: ACCEPTABLE WITH CONDITIONS (natural screens to reduce aquatic birds disturbance)
- Psychological: 165 visitors/day
- GLOBAL: 165 visitors/day



Date	Daily num. of visitors
01/05/2015	102
02/05/2015	155
03/05/2015	157
11/07/2015	127
25/07/2015	169
13/09/2015	216
04/10/2015	258
05/10/2015	73
10/10/2015	166



CONCLUDING REMARKS

- Carrying capacity assessment is an interesting approach to face a classical question: Is *my protected area crowded? How much?*
- Try to indentify previously what kind of facility/service/activity has problems and focus on it: trails? parking areas? canyoning?...
- Values aren't "magical numbers": it's a mean to introduce strategies and tactics for managing recreation impacts.
- Methods should be flexible enough in order to be adapted to local conditions of protected areas (habitats, species, visitor profiles, management capacity...).
- More European studies and experiences are expected: Do you know any?



EXPERIENCES IN SPANISH PROTECTED AREAS

National Parks:

- Cabañeros
- Aigüestortes i Estany de Sant Maurici

Natural Parks:

- Hoces del río Riaza
- Moncayo
- Delta del Ebro
- Sierra y Cañones de Guara (canyoning)
- Parque Rural de Teno
- Bardenas Reales de Navarra
- Gorbea (*in progress*)

Biosphere Reserves:

- Urdaibai

Periurban Parks:

- Espacio Natural Txingudi
- Parque Metropolitano de los Toruños y Pinar de La Algaída

Other:

- Cabo de Palos – Islas Hormigas (scuba diving)
- Natural Monument of Praia das Catedrais
- Natural Monument of Bandama
- Natural Monument of San Juan de Gaztelugatxe (*in progress*)



REFERENCES:

- Cole, D. N. (2001). **Visitor use density in wilderness experiences: a historical review of research.** USDA Forest Services Proceedings RMRS-P-20. Missoula. USA.
- Cole, D. N. et al. (1987). **Managing wilderness recreation use: common problems and potential solutions.** General Technic Report INT-230. Ogden, UT: USDA Forest Service, Intermountain Research Station. 60 p.
- Leung, Y. & Marion, J. L. (2000). **Recreation impacts and management in wilderness: a state of knowledge review.** USDA Forest Services Proceedings RMRS-P-15. Vol. 5.
- Cifuentes, M. (1992). **Determinación de la capacidad de carga turística de áreas protegidas.** CATIE. Serie técnica. Informe técnico 194. Turrialba, Costa Rica. 26 pp.
- Buckley, R. (Ed.) (2004). **Environmental impacts of ecotourism.** Ed. Cabi. Oxfordshire (UK). 389 pp.
- Gómez-Limón, J. & García Ventura, D. (2014). **Capacidad de acogida de uso público en los espacios naturales protegidos.** Serie Cuadernos de la Red de Parques Nacionales (OAPN) nº 3. Ministerio de Agricultura, Alimentación y Medio Ambiente. Madrid. 84 pp.

THANK YOU FOR YOUR ATTENTION



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