



FEDERAZIONE ORDINI
DEI DOTTORI AGRONOMI
E DEI DOTTORI FORESTALI
PIEMONTE - VALLE D'AOSTA



REGIONE
PIEMONTE

Ministero della Giustizia

Convegno "Giornate internazionali delle foreste e dell'acqua: il ruolo della gestione forestale nei processi idrologici e di assetto idrogeologico del territorio"

MA QUANTA ACQUA?

Vegetazione e processi idrologici

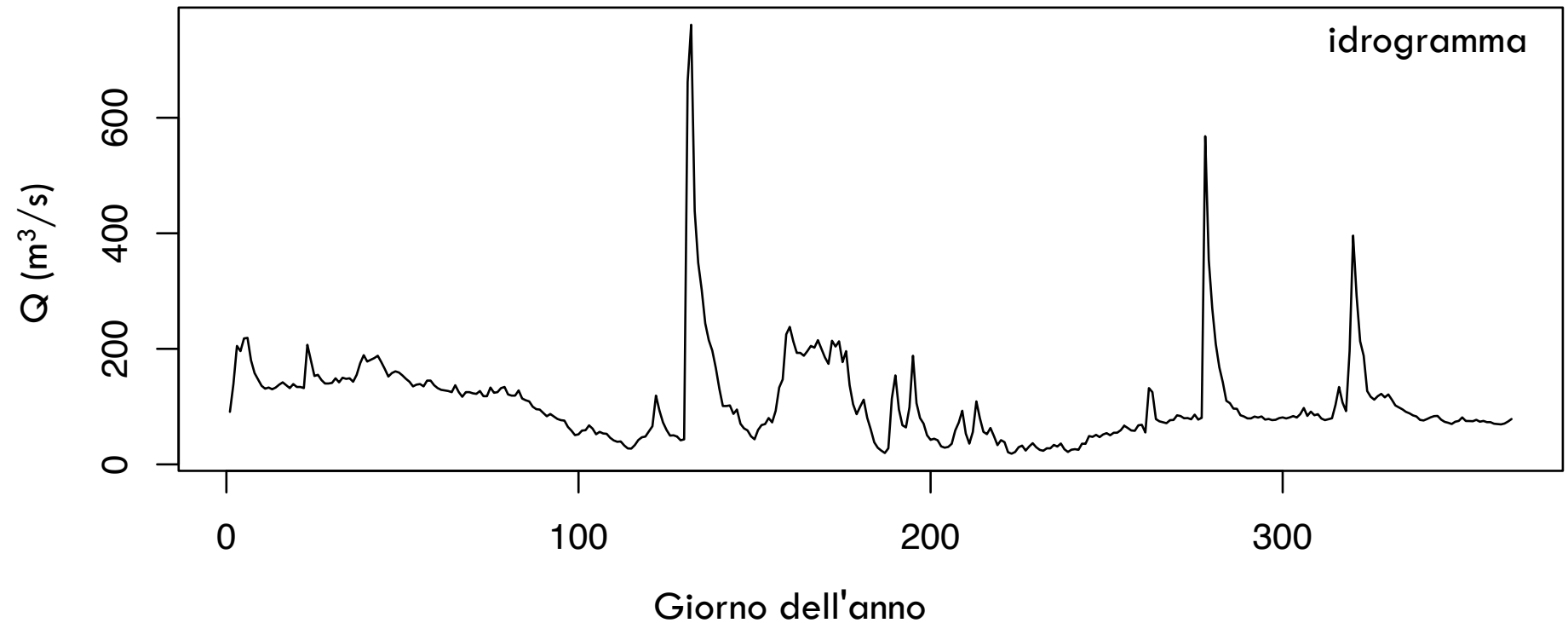
Daniele Ganora

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dell'Ambiente, dei Trasporti e
delle Infrastrutture

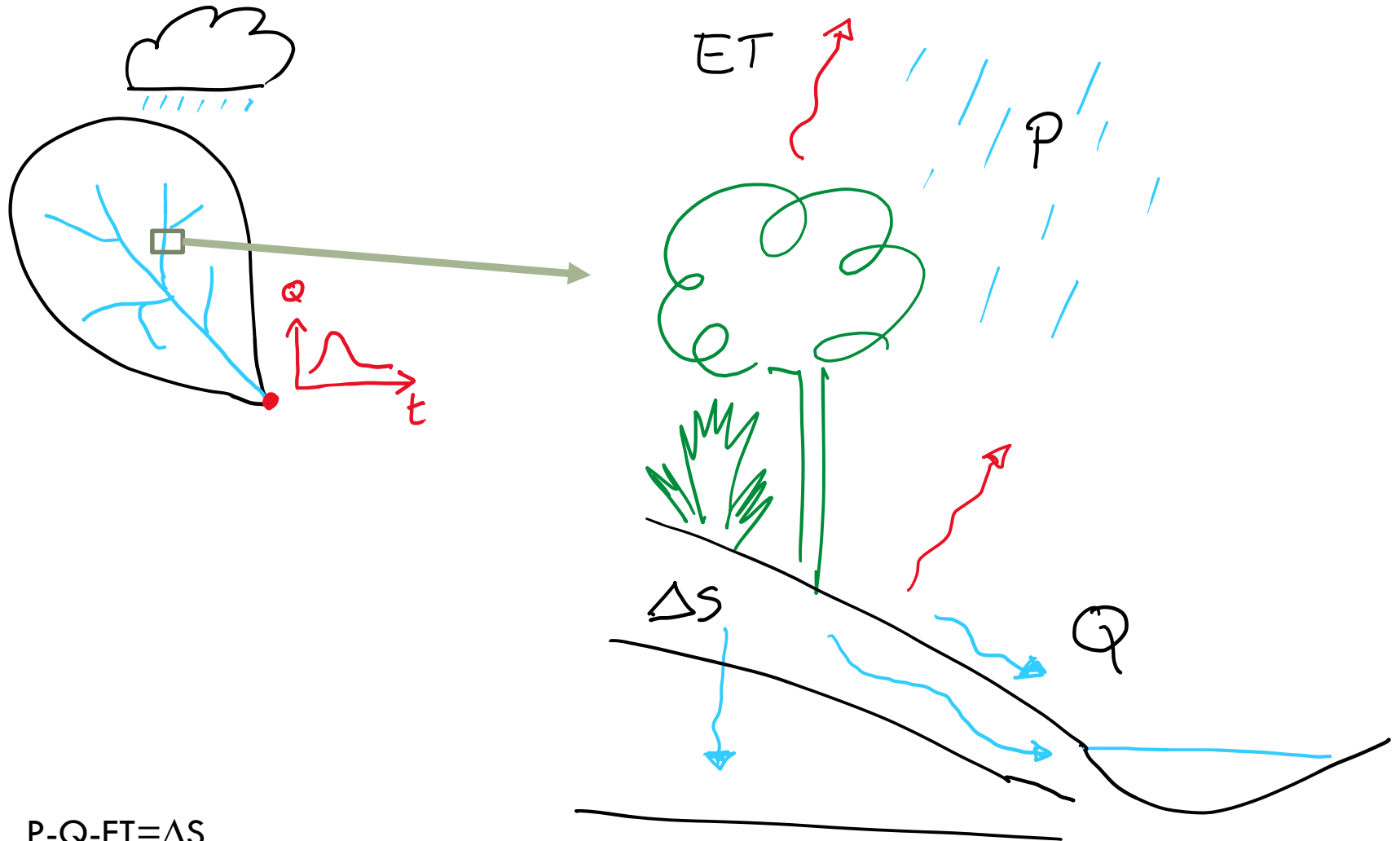


**Politecnico
di Torino**

Quale acqua, quanta acqua?



Il bacino idrografico



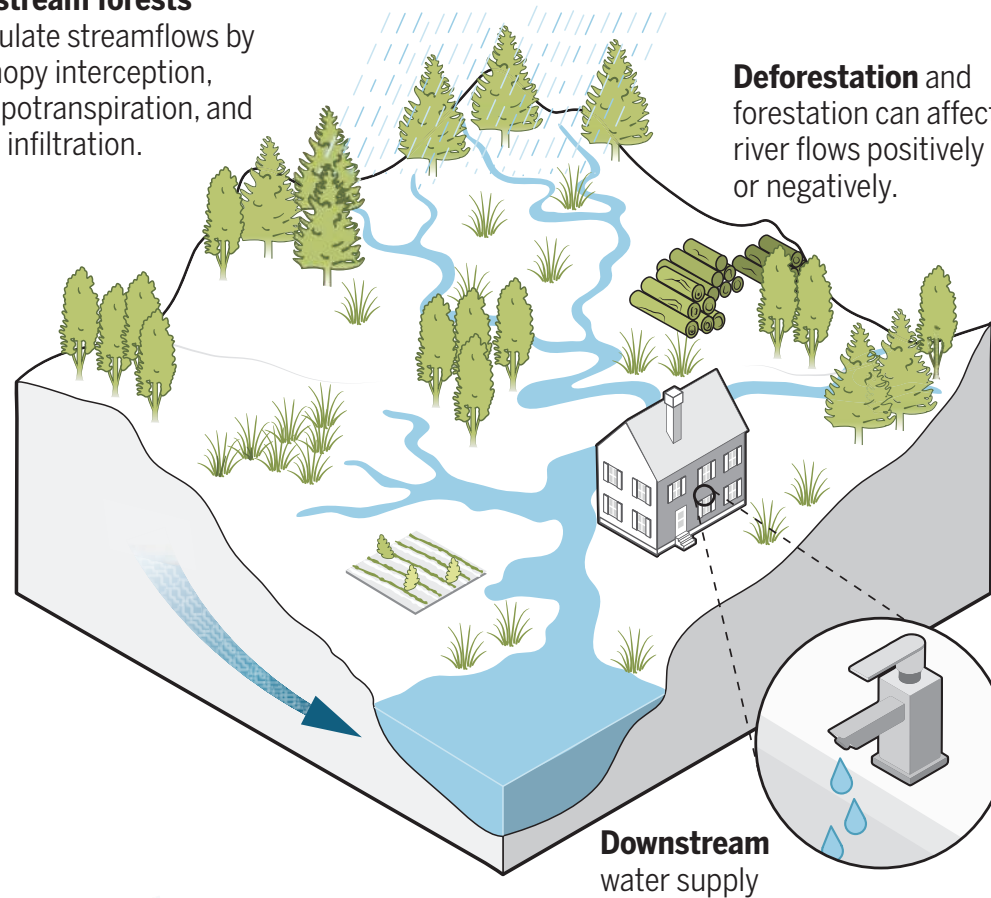
The complex influence of forests on water supply

Forests in watersheds play a critical role in regulating downstream water supply and associated ecosystem services.

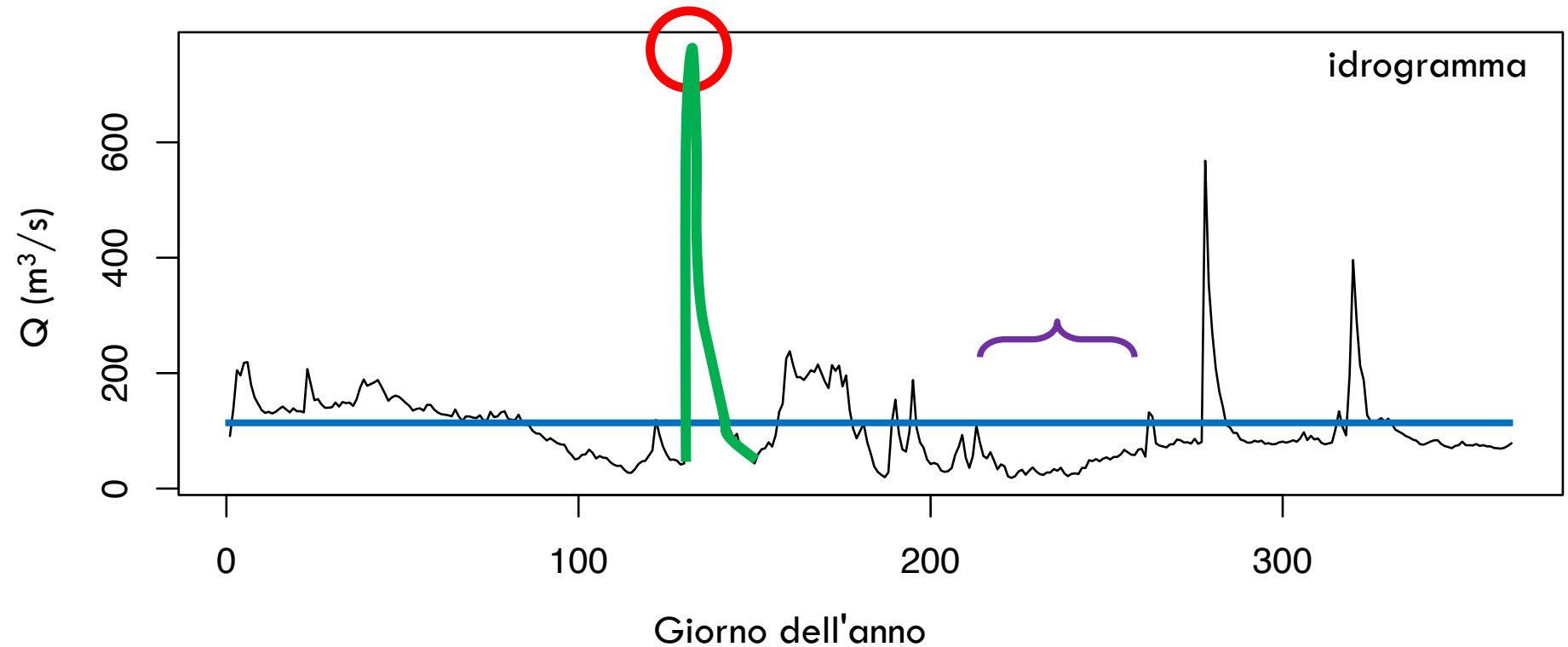
Upstream forests

regulate streamflows by canopy interception, evapotranspiration, and soil infiltration.

Deforestation and forestation can affect river flows positively or negatively.

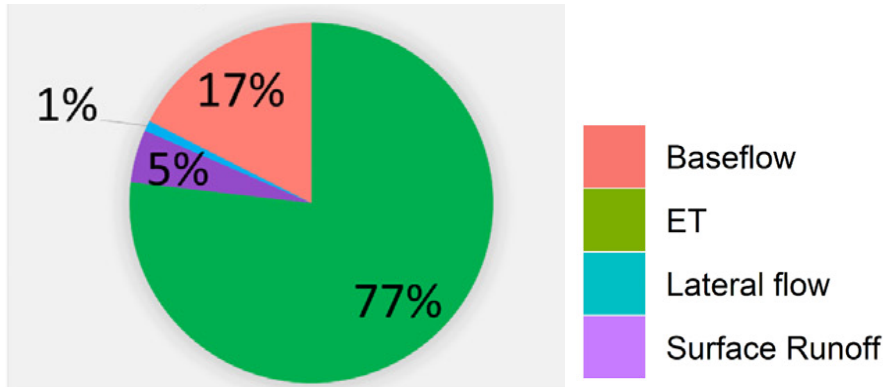


Quale informazione idrologica?

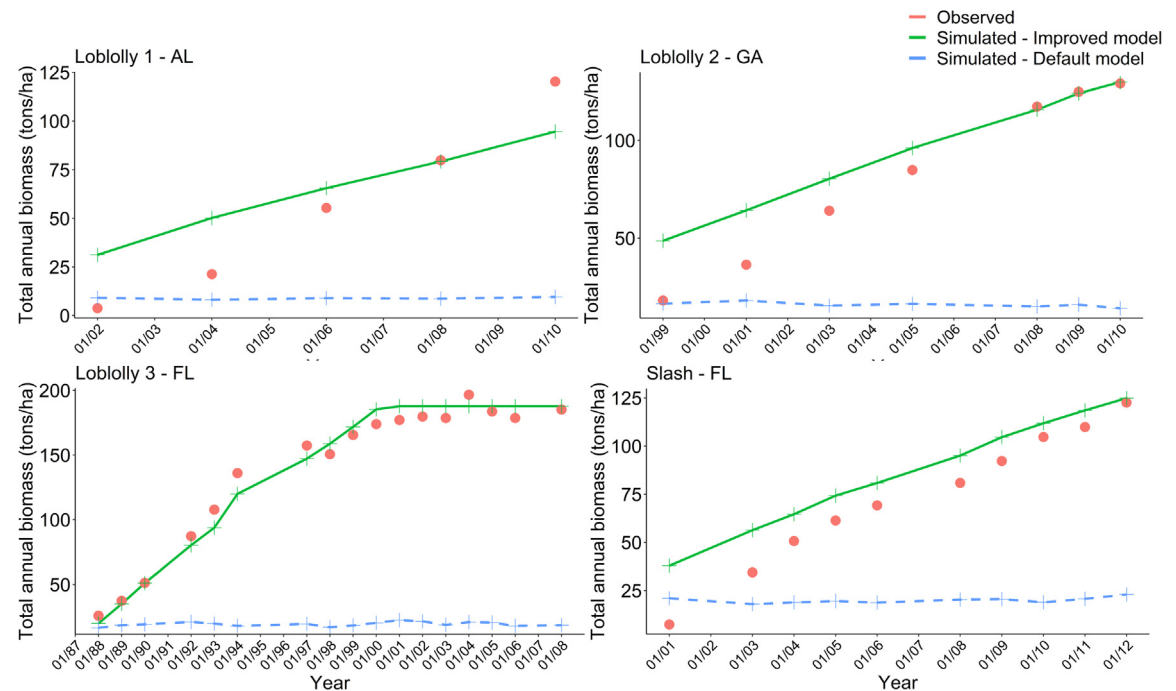


Scale temporali e spaziali...

Analisi quantitativa

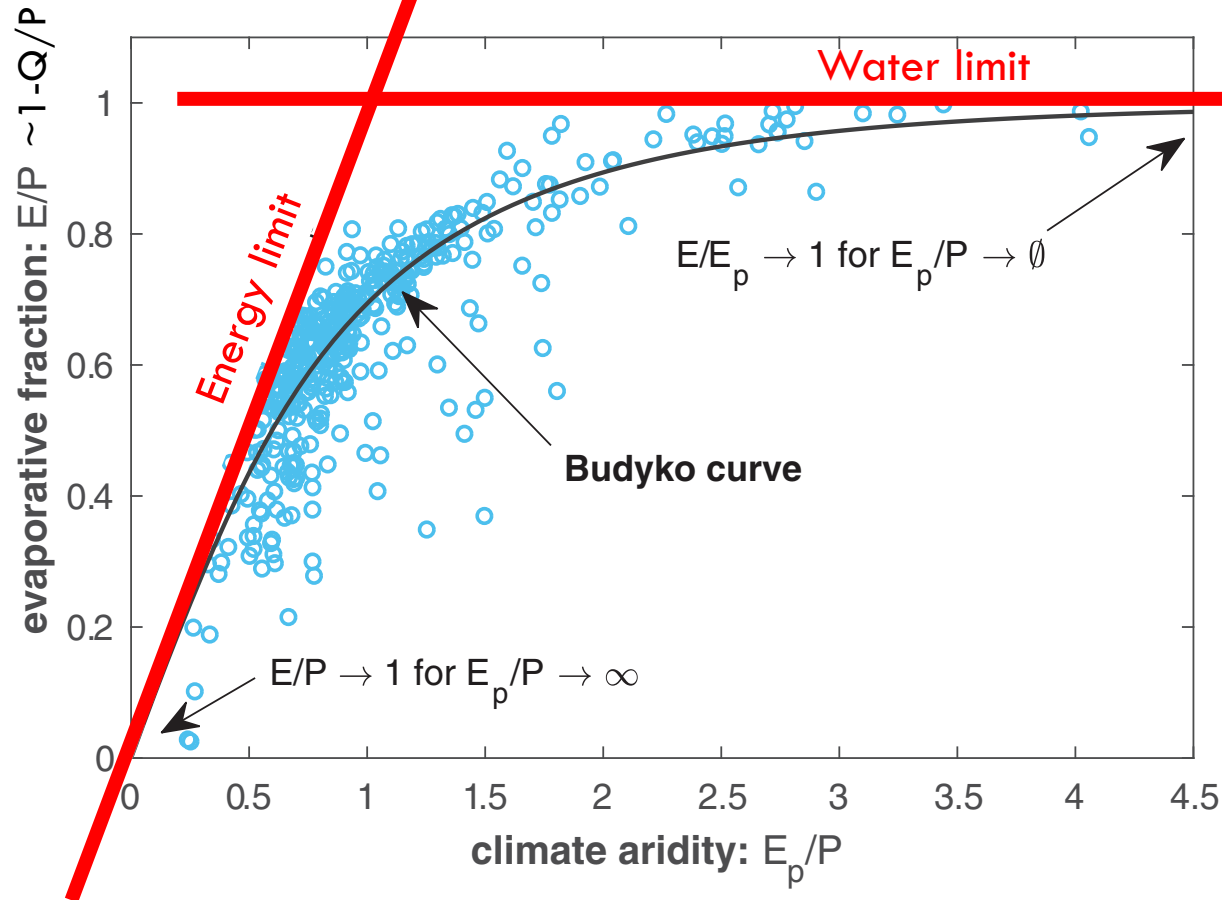


Descrizione dei singoli processi

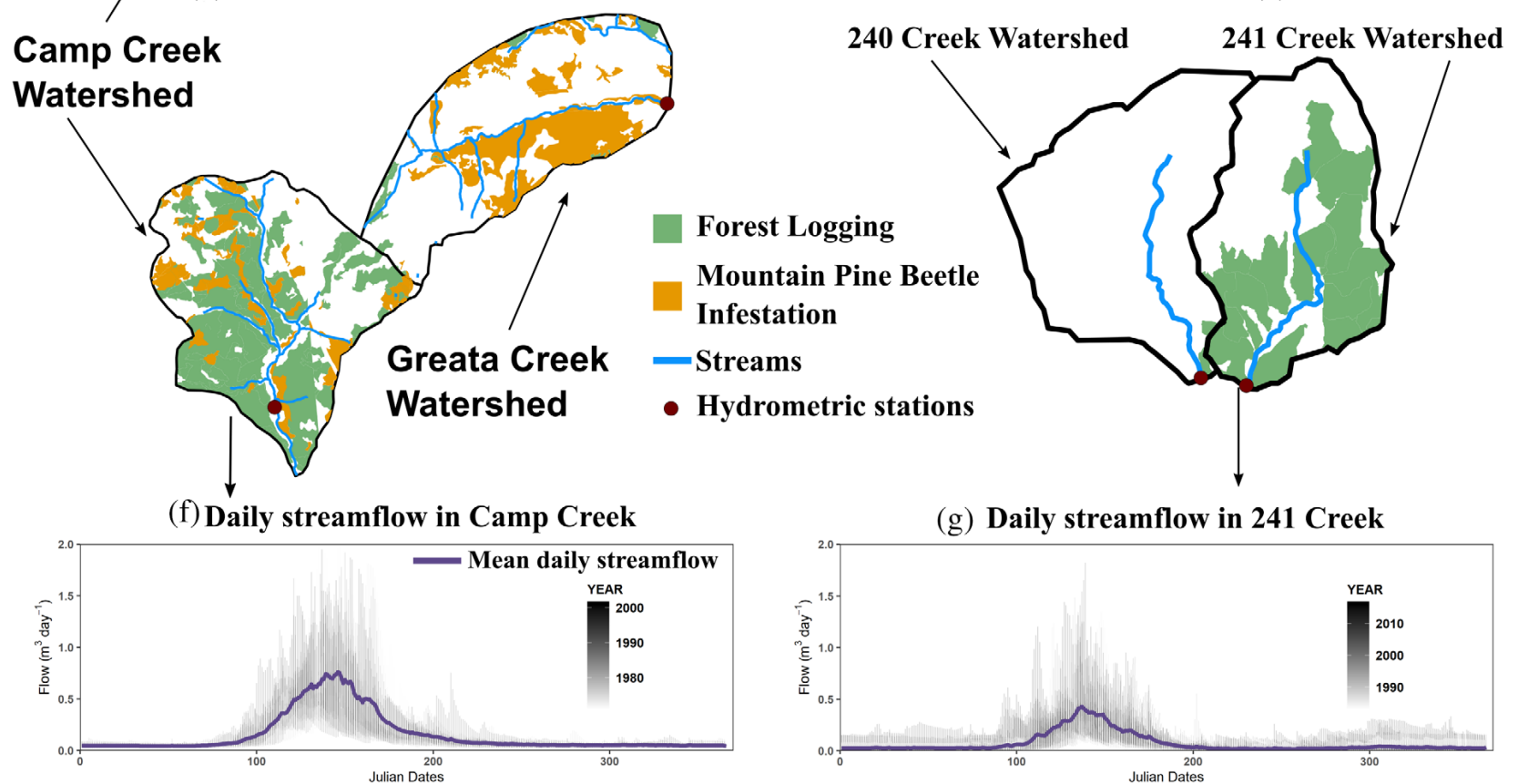


Analisi quantitativa

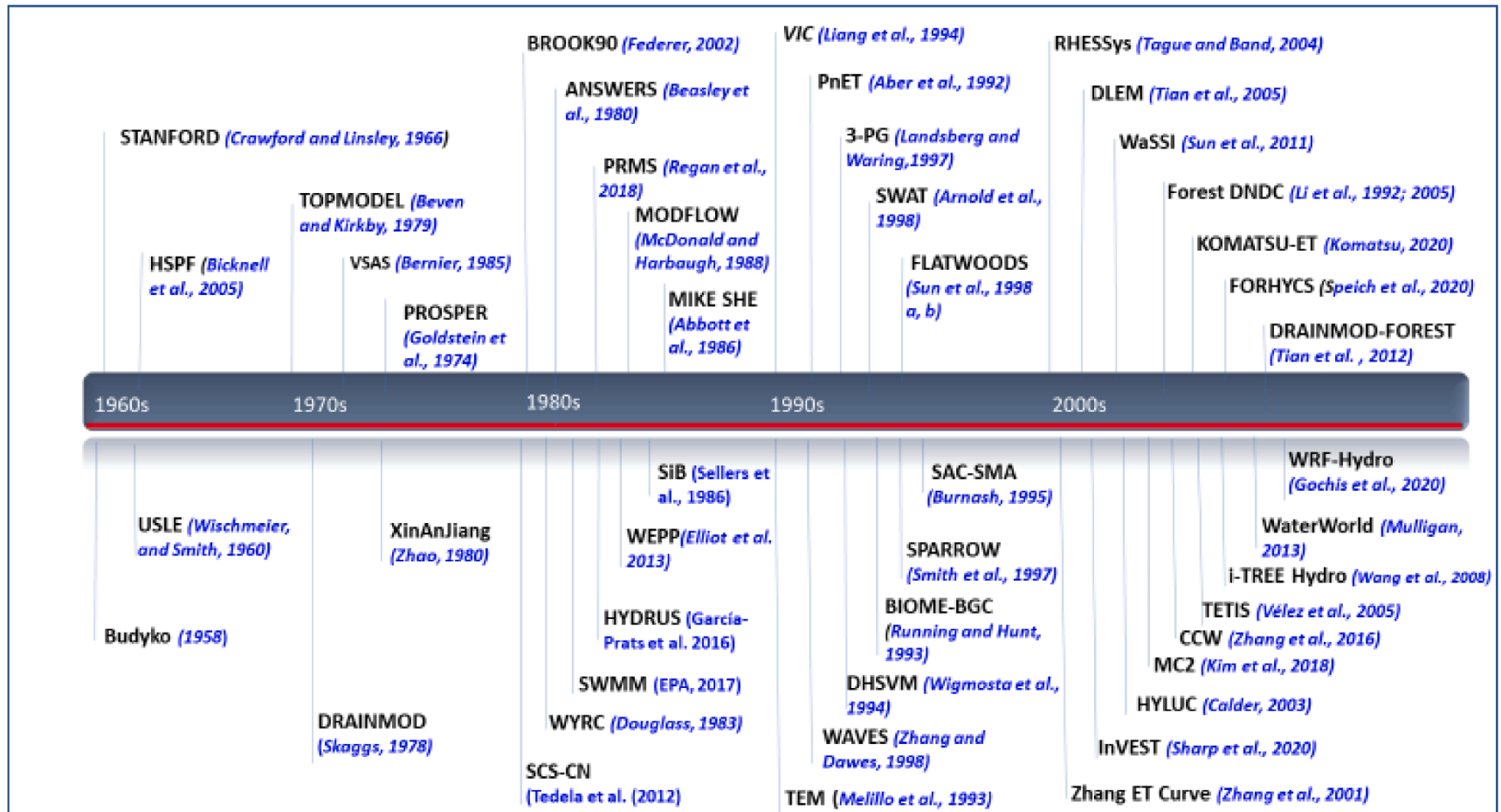
Analisi a scala di bacino

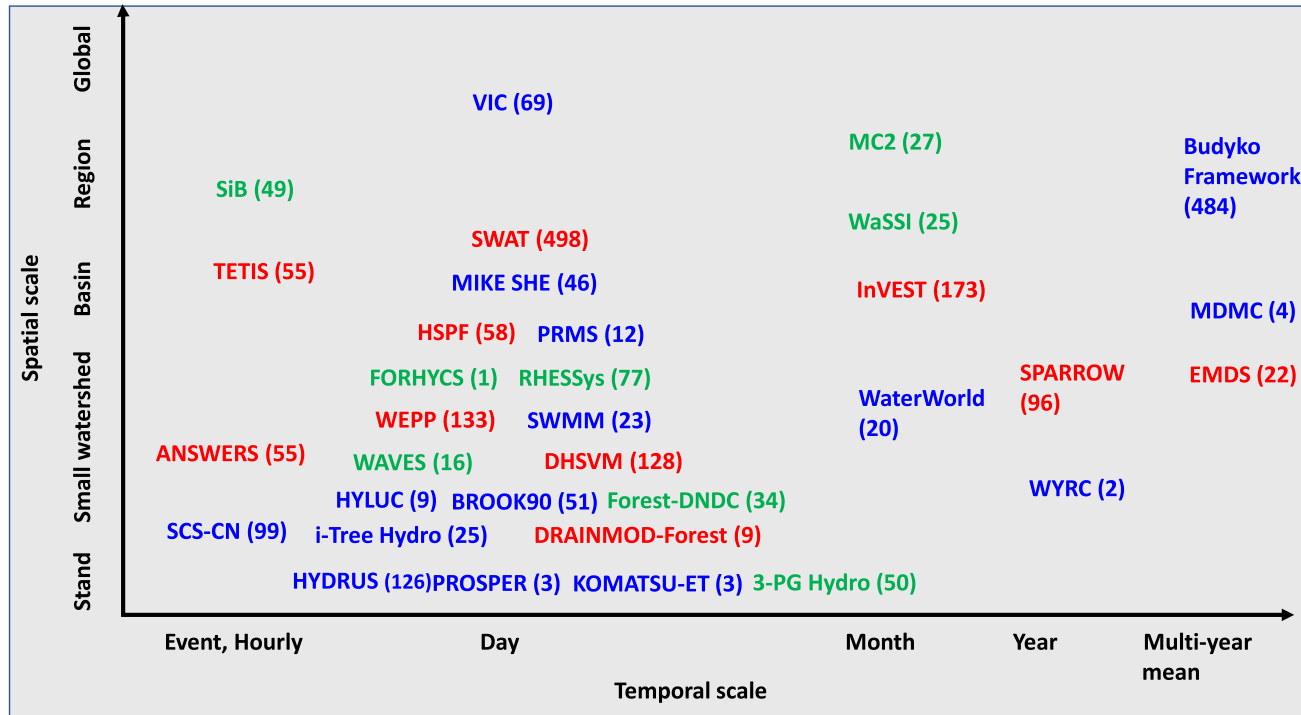


Analisi comparativa



Modelli, modelli, ...

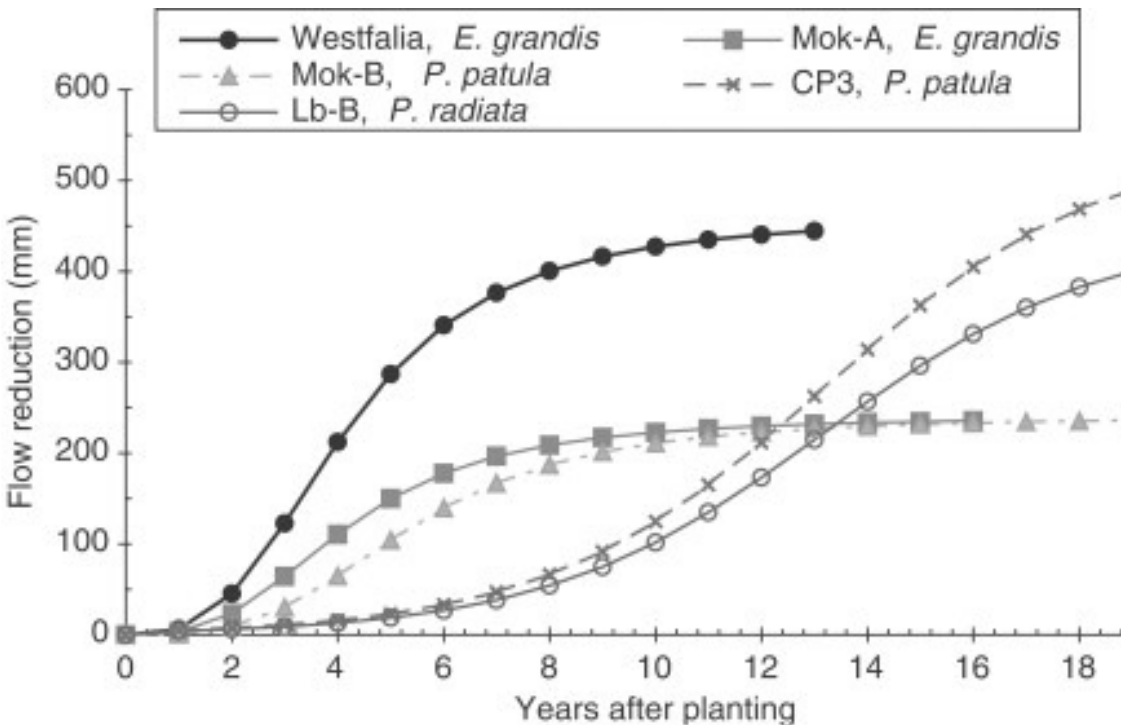




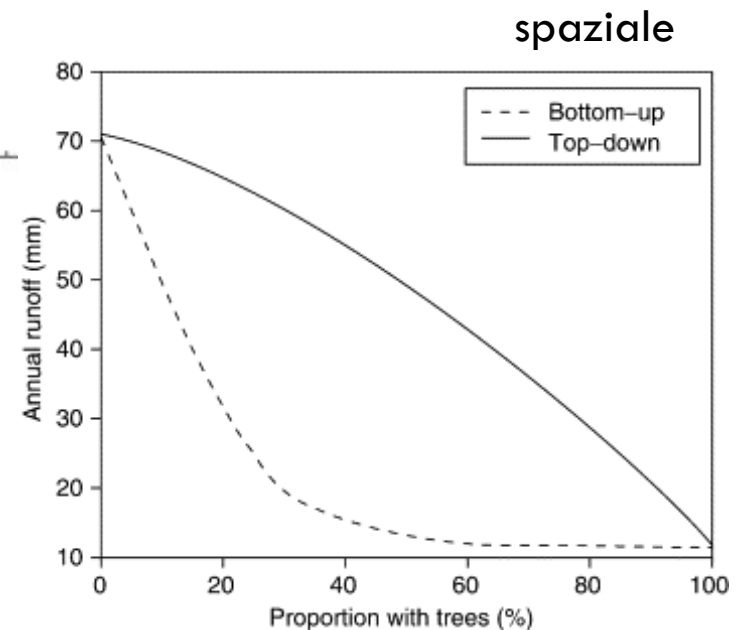
- Scale spaziali adeguate
- Scale temporali adeguate
- Dati di input: osservazioni, previsioni, proiezioni

- Incertezza epistemica (completezza dei processi)
- Incertezza dei parametri ed equifinalità

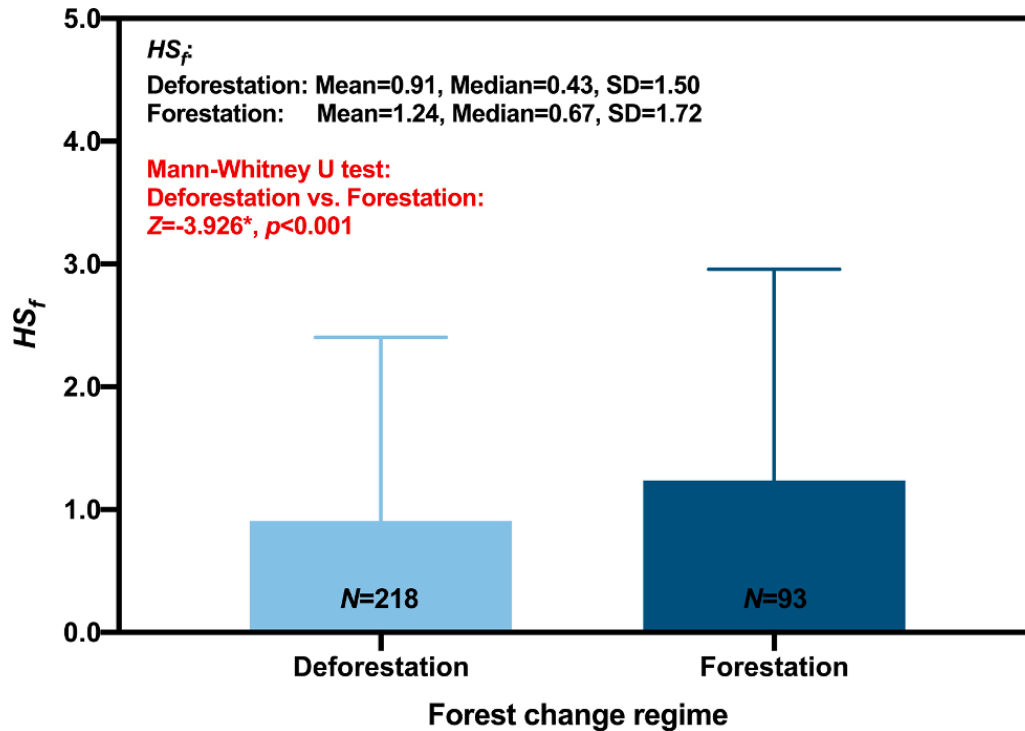
Effetto della vegetazione



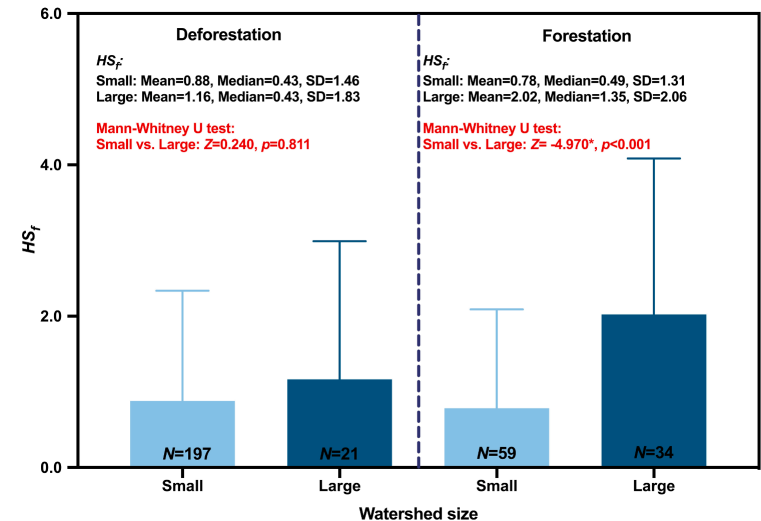
temporale



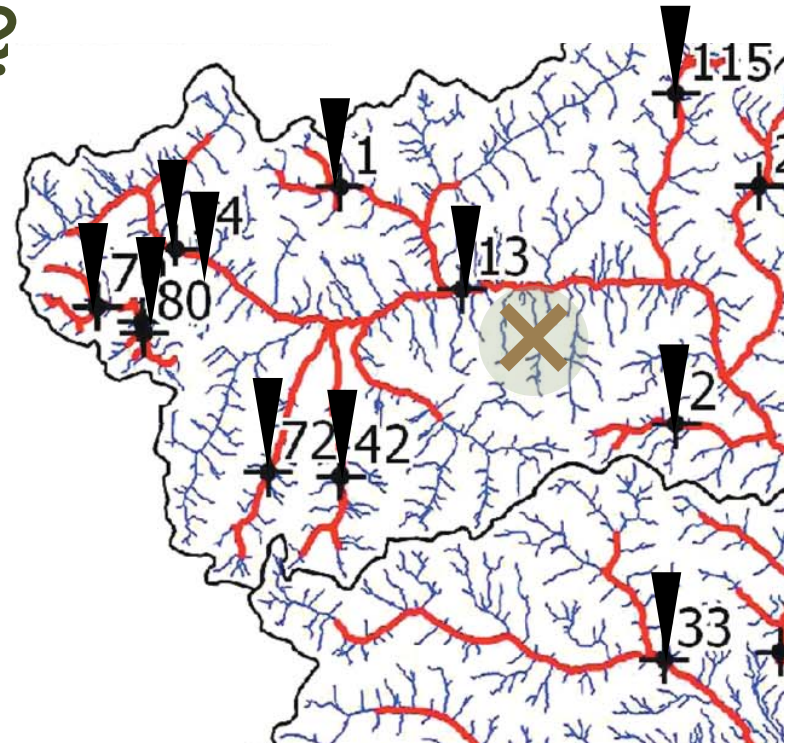
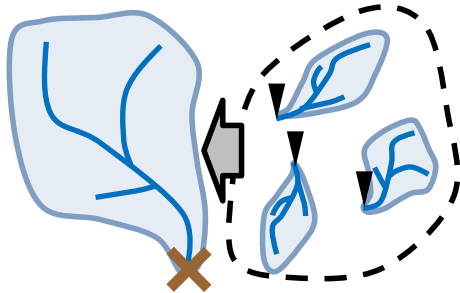
Variazioni dinamiche



HS variazione relativa deflusso
 causata dal cambiamento della
 superficie forestata



E se non ho i parametri?



Dati di letteratura vs modelli regionali

Trasferimento informazioni da siti strumentati a siti non strumentati
(sostituzione del tempo con lo spazio)

- Modello statistico
- Modello fisicamente basato

Impatti, previsioni, azioni

Table 2

Adaptive Forest management options to manage hydrological impact of climate change.

Environment	Hydrological Impact	Risks to forest ecosystem and society	Adaptive forest management options
Semi-arid and arid watersheds Temperate watersheds with distinct dry seasons	ET (+), annual streamflow (-), low flow (-), and peak flow (-)	Water shortage, drying up of streams; Increasing soil moisture stress and hydrological droughts; Increasing invasive species, forest degradation; Loss of aquatic and floodplain habitats	Thinning; Selective logging of plantations with high water use (e.g., young plantations, Radiata pine or Eucalyptus plantations) Removal of invasive species; Plant native species; Replacement of drought avoidant species (e.g., <i>Pinus sylvestris</i>, <i>Pinus nigra</i> and <i>Pinus strobus</i>) with drought-tolerant species (e.g., <i>Quercus rubra</i> and <i>Quercus faginea</i>) Increasing water retention facilities (e.g., terrace, and pond) for water storage and irrigation.
	ET (-), annual streamflow (+), low flow (-), and peak flow (+)	Increasing flood risks and sediment; Tree dieback or mortality; Increasing forest fires and insect infestations; Loss of aquatic habitats	Increasing water retention facilities (e.g., terrace, and pond) for flood control, sediment control and dry season water supply; Reducing tree stocking, removal of forest litter, increasing fire buffers, and thinning forests, prescribed burning; Removal of infected or dead trees, and pest control by introducing predators; Restore fire-burnt forest floors; Maintain and increase forest riparian buffers.
Alpine and boreal snow-dominated	ET (+), annual streamflow (-), low flow (-), and peak flow (-)	Water shortage; Increasing soil moisture stress and summer hydrological droughts; Forest structure and species composition changes (e.g., increasing invasive species or broadleaf species); Forest expansion with tree-line shift; Increasing insect infestations; Loss of aquatic and floodplain habitats.	Thinning; Selective logging of invasive species or broadleaf species (e.g., birch) with highwater consumption; More logging activities performed at higher elevations to synchronize snow-melt processes at both high and low elevations; Removal of infected or dead trees, and pest control by introducing predators; Increasing water retention facilities (e.g., terrace, and pond) to guarantee water supply and restore aquatic and floodplain habitats.
Subtropical and tropical rain-dominated watersheds	ET (-), annual streamflow (+), low flow (-), and peak flow (+)	Increasing flood risks and sediment; Loss of aquatic habitats.	Restoring hydrological functions of natural forests; Increasing plantations; Redesigning logging roads (e.g., minimizing direct discharge of runoff from roads to streams) and installing larger culverts for flood control; Constraining or carefully designing logging activities (e.g., time, location, proportion, and soil disturbance) ; Maintain and increase forest riparian buffers.

Il punto di vista dell'ingegnere

Approccio quantitativo, ma con incertezza

Valutare molteplici caratteristiche idrologiche

Comprendere la variabilità del deflusso in funzione dello stato del bacino (e delle foreste)

Non solo bacini "naturali" anche NBS urbane!

Non c'è UN valore di progetto

Multidisciplinarietà e nuove applicazioni