Towards an integrated and cooperative management of fine sediment fluxes in a large trans-boundary basin: the case of Upper Rhône River

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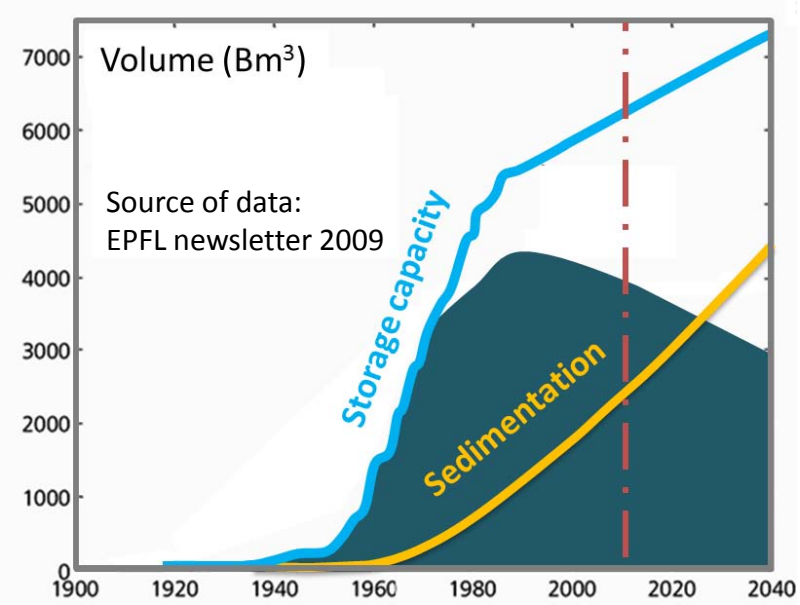
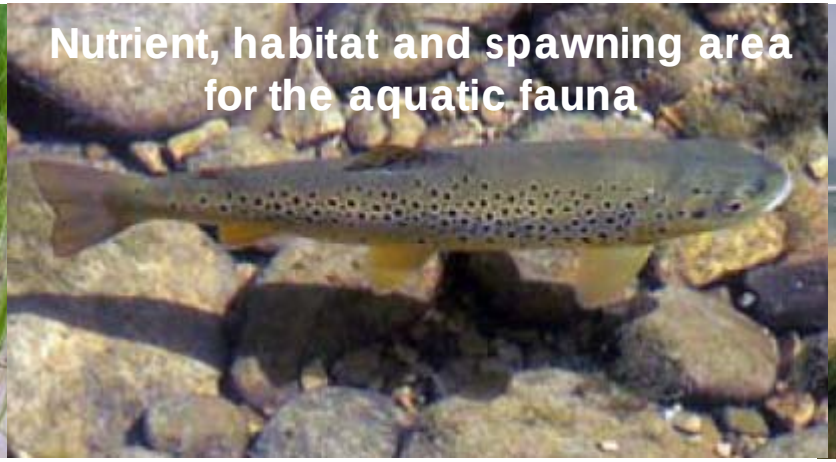
Content

- Introduction
- Geographic context
- Strategies previously applied
- Historical evolution of flushing impacts
- Recent considerations
- Conclusion

Why sediment management is an essential issue?

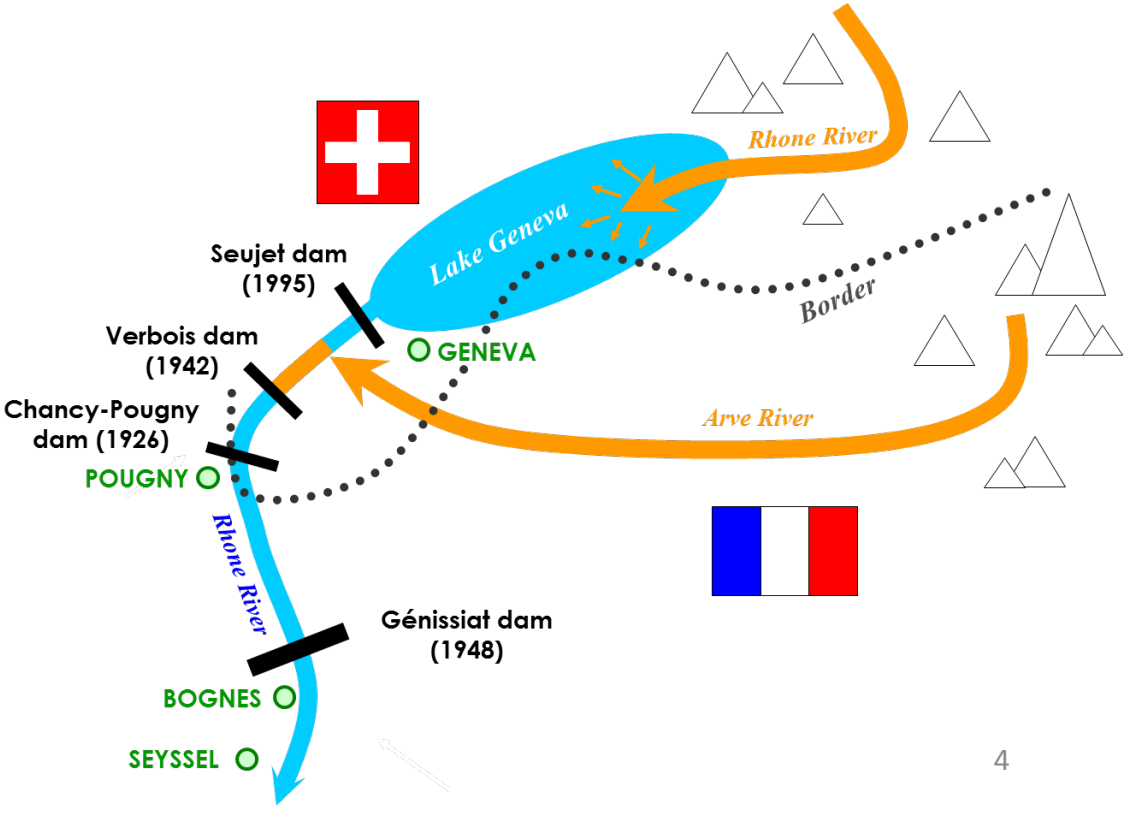




Context


0
100 km
GERMANY
SWITZERLAND
FRANCE
ITALY
Verbois dam
Geneva
Rhône River
Génissiat dam
Lyon
Rhône River
Marseille
Mediterranean Sea


Rhône River
Arve River


Rhone River
Lake Geneva
Border
Seujet dam
(1995)
GENEVA
Verbois dam
(1942)
Chancy-Pougny
dam (1926)
Arve River
POUGNY
Rhone River
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BOGNES
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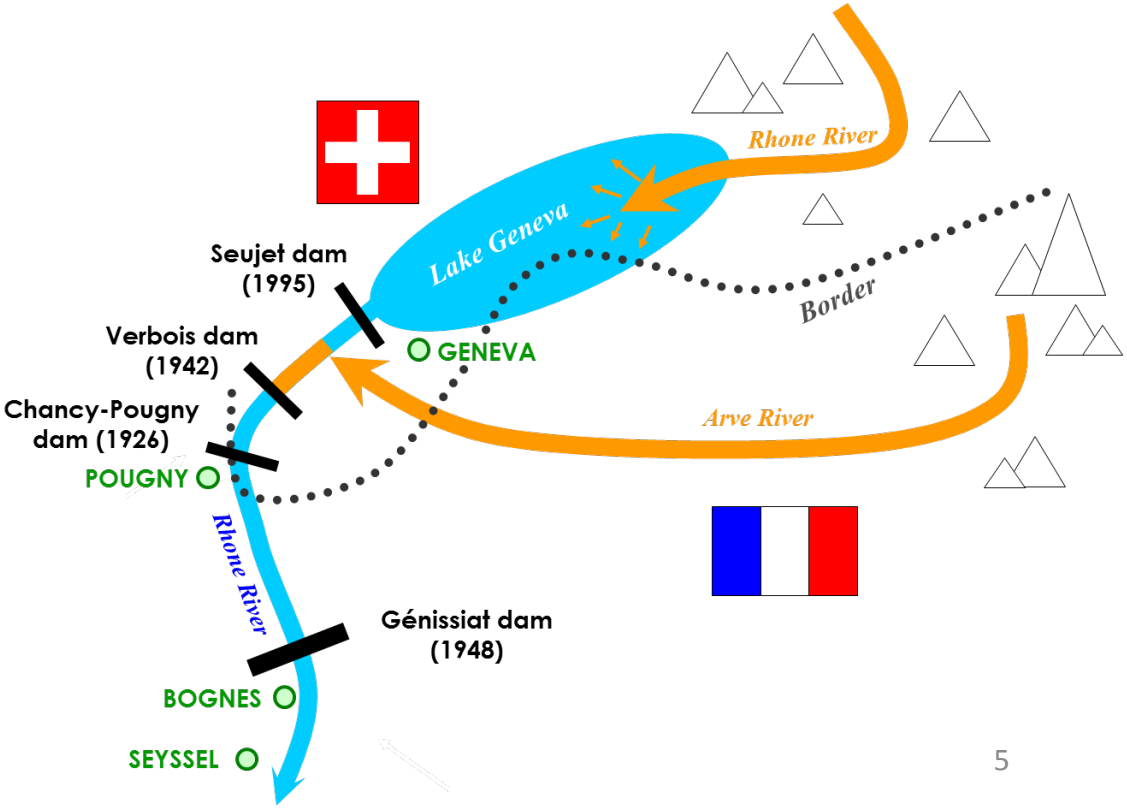
Verbois dam (SIG)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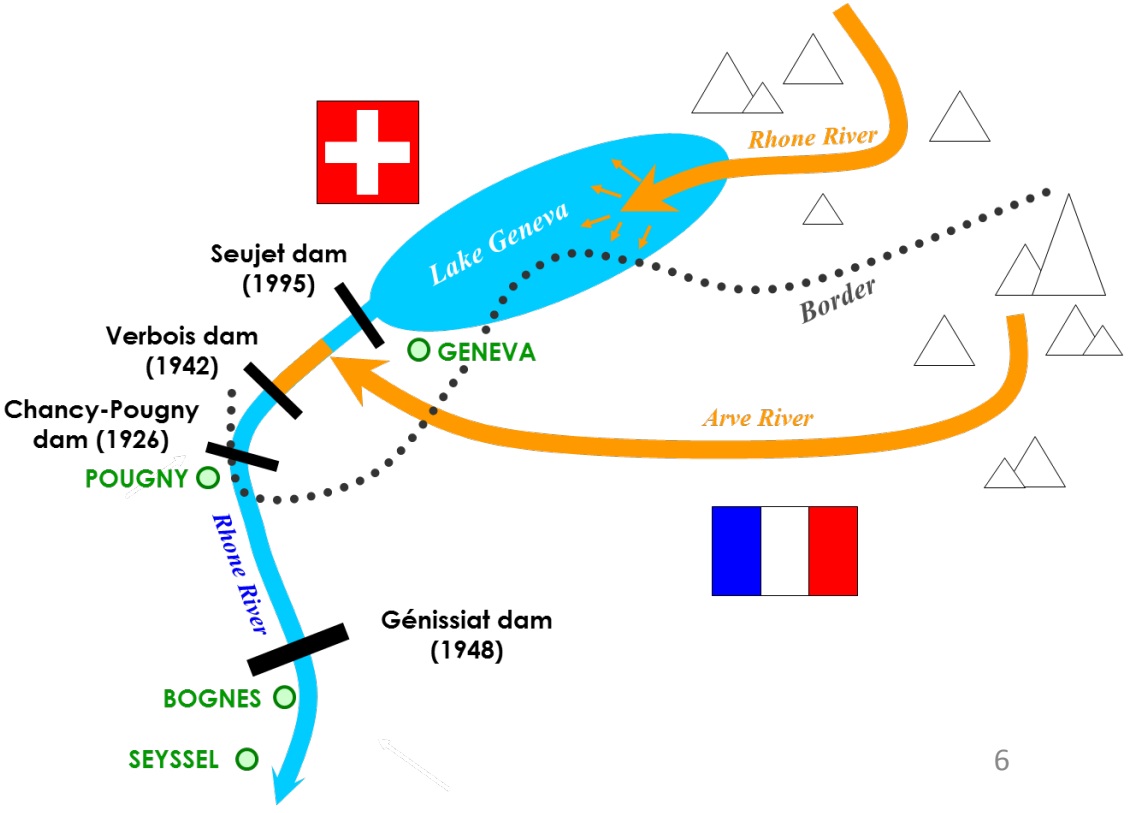
Génissiat dam (CNR)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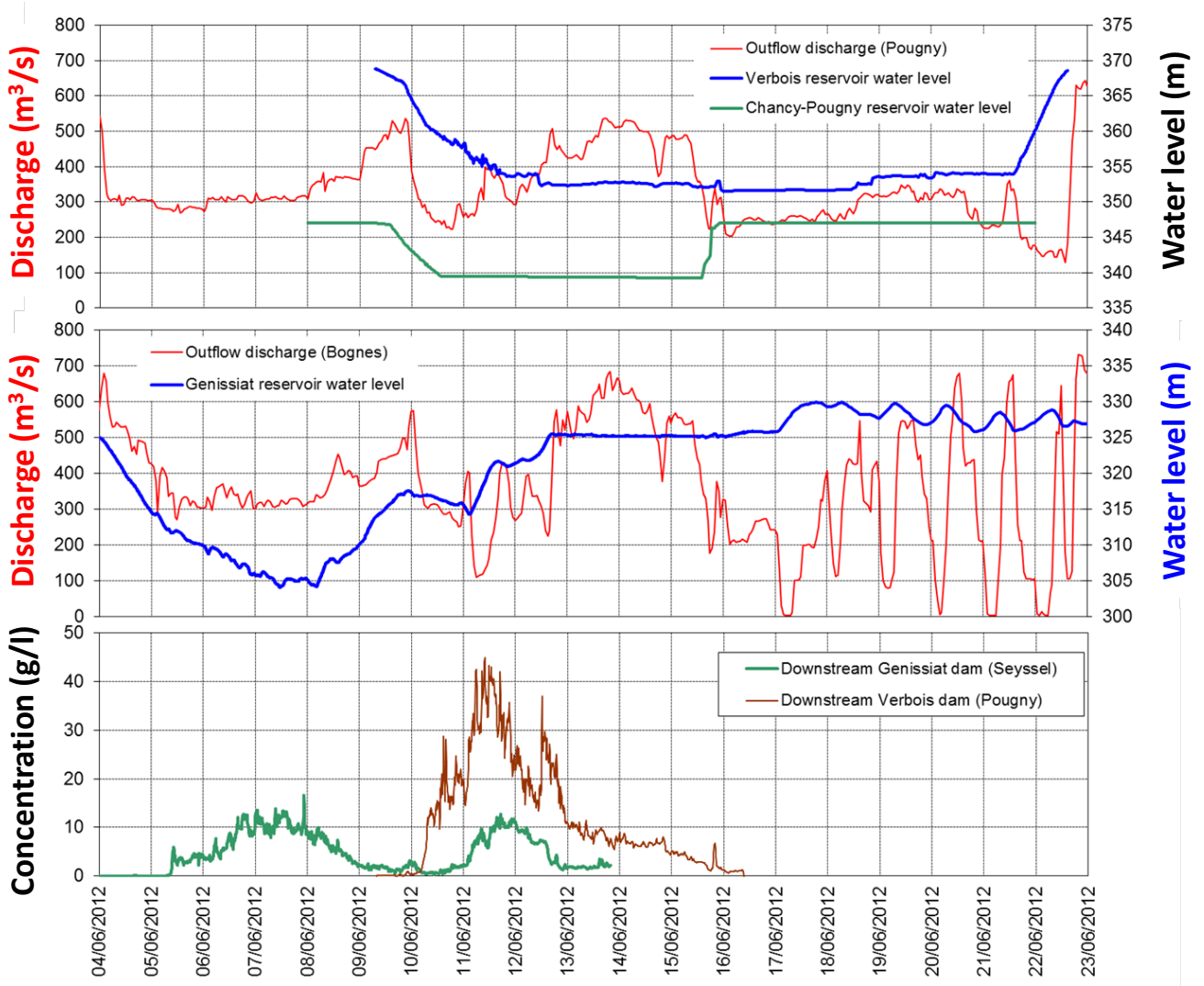
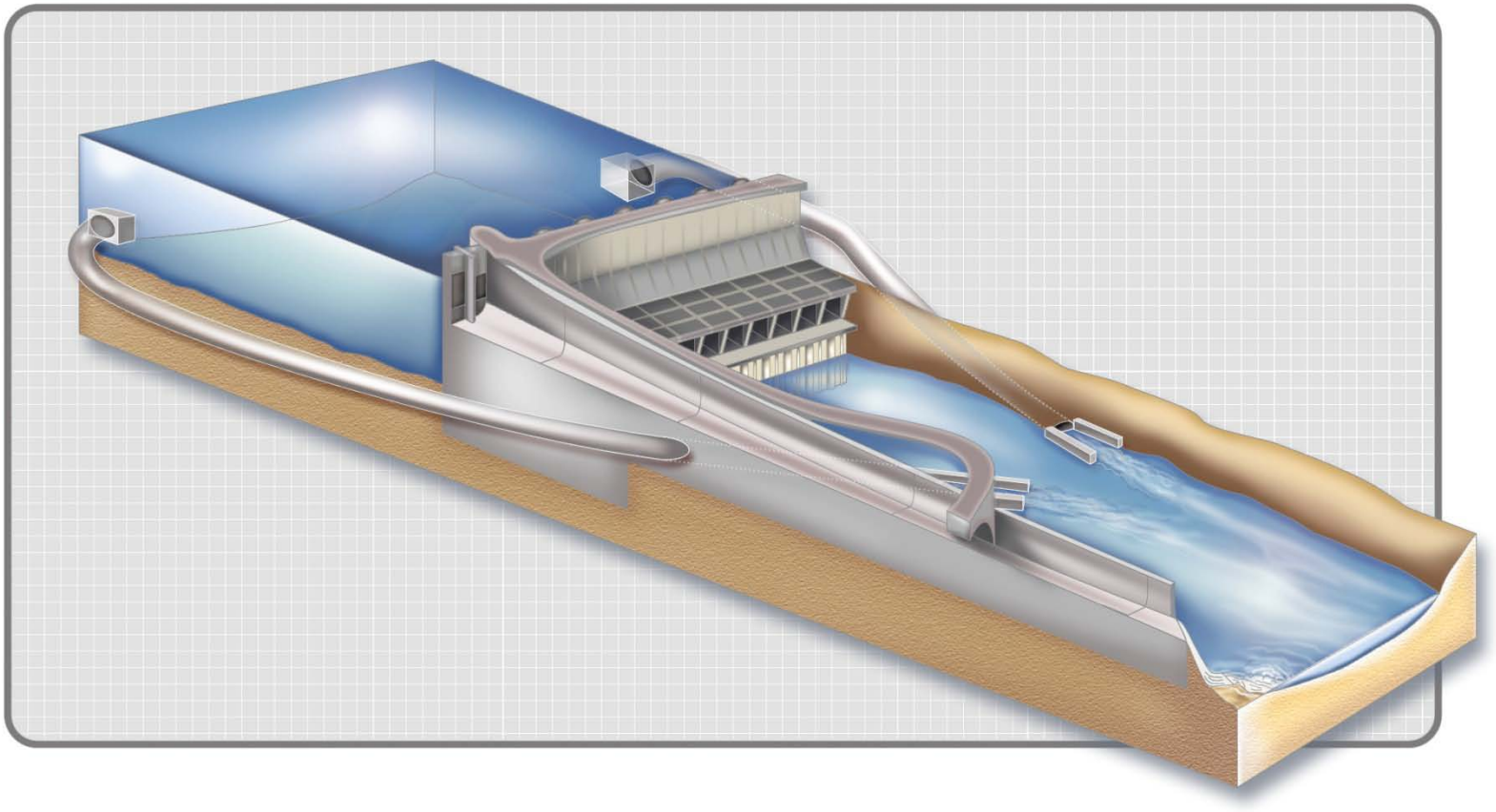
Sediment management in Swiss reservoirs until 2012

Sediment management in Génissiat reservoir until 2012

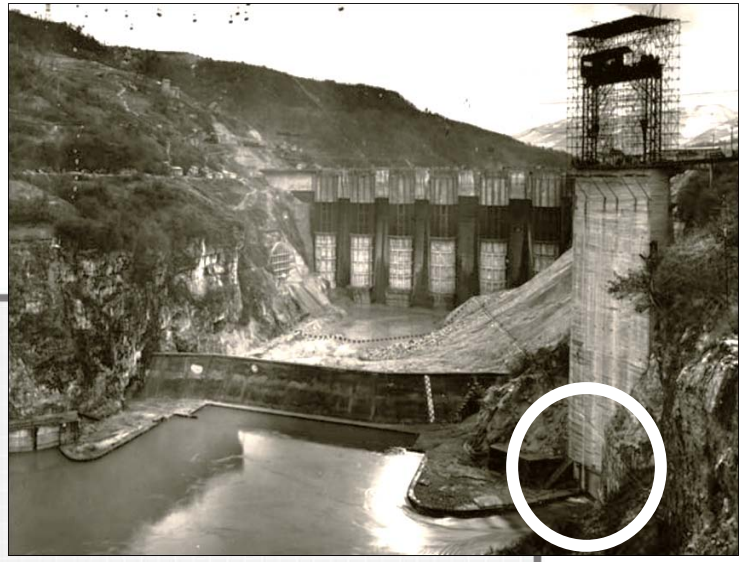


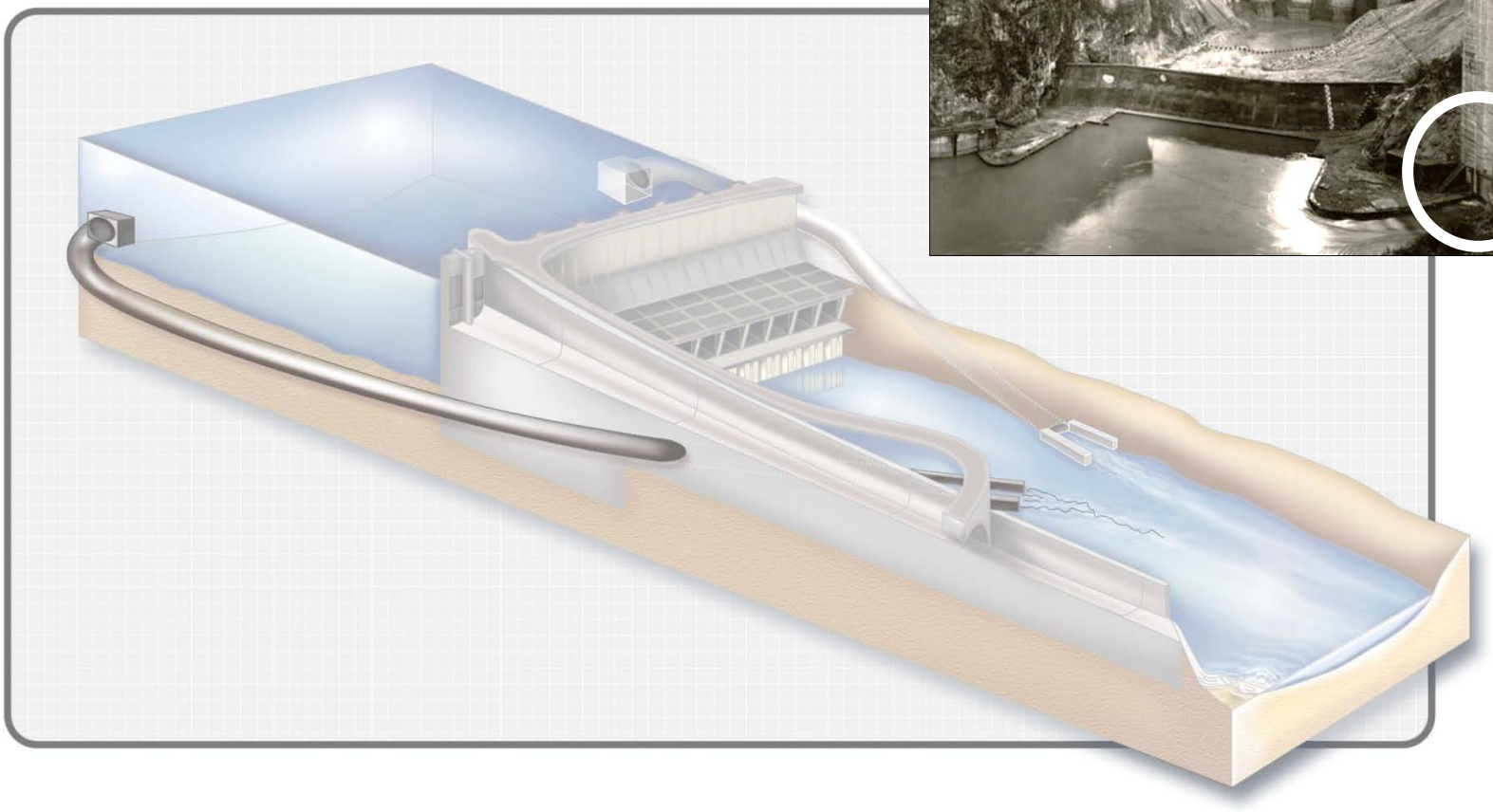
Génissiat dam features



- Génissiat dam includes 3 hydraulic outlets located at 3 different elevations

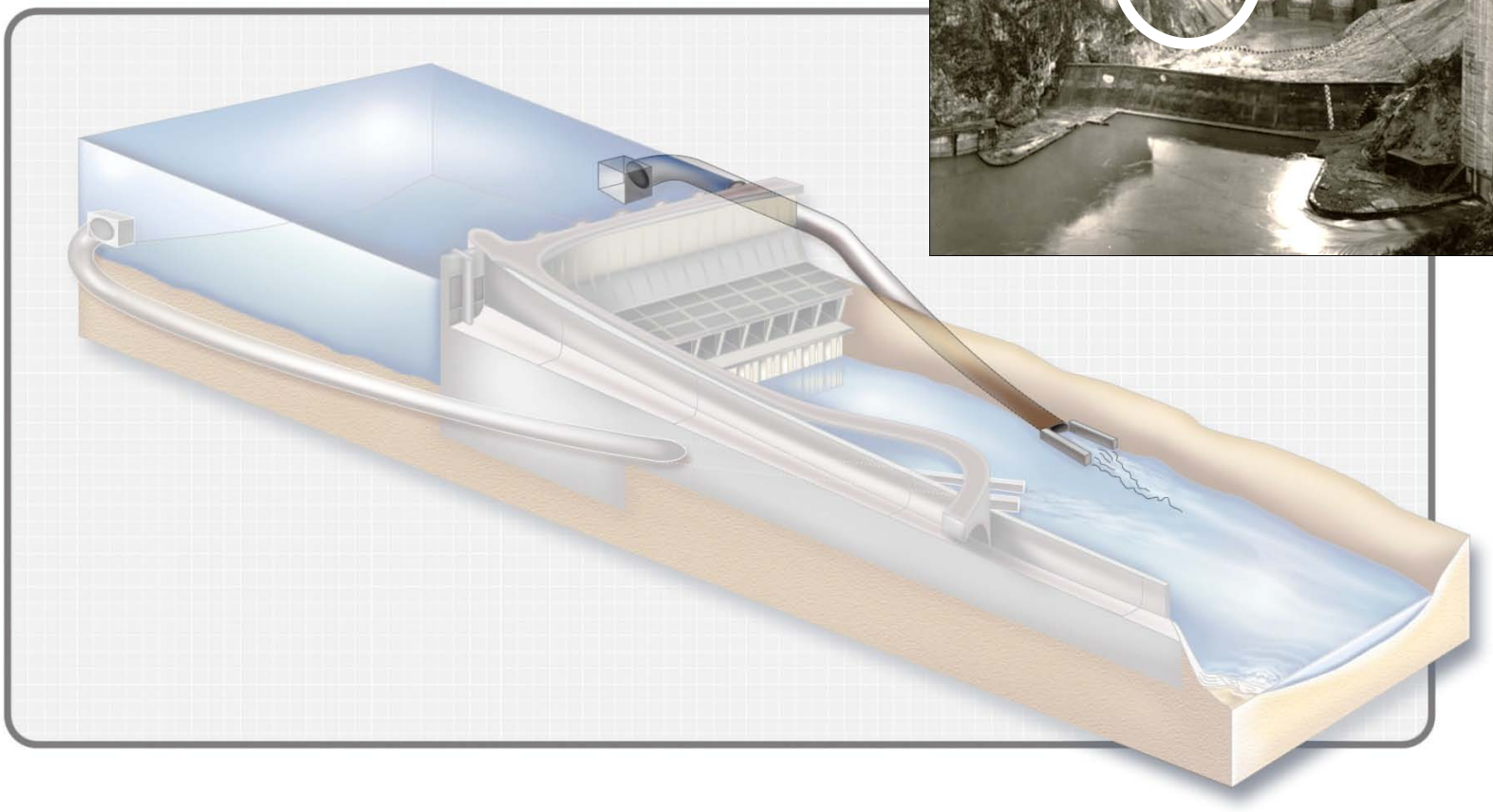
Génissiat dam features





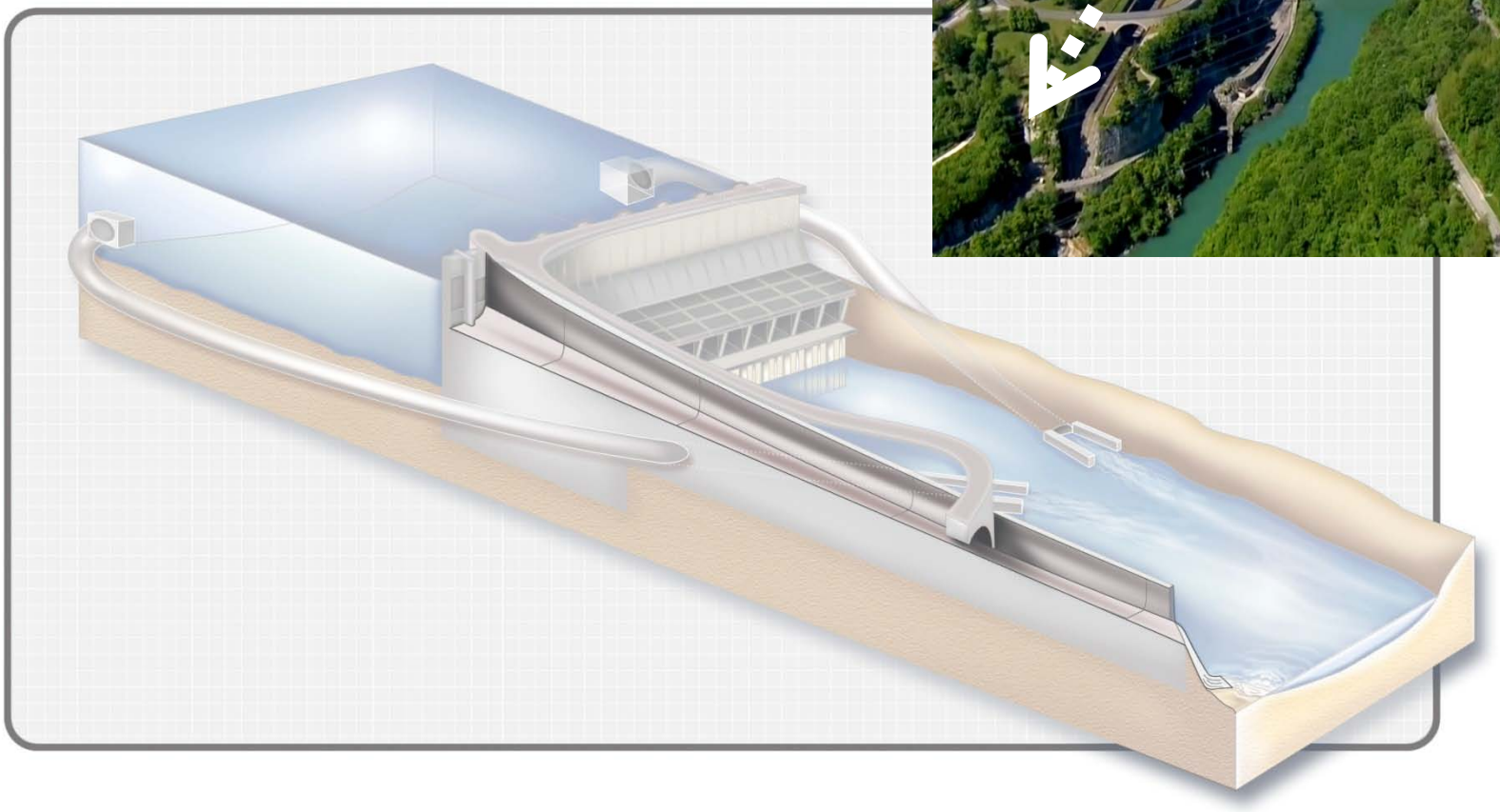
- Bottom gate: intake elevation at 262.00 m

Génissiat dam features



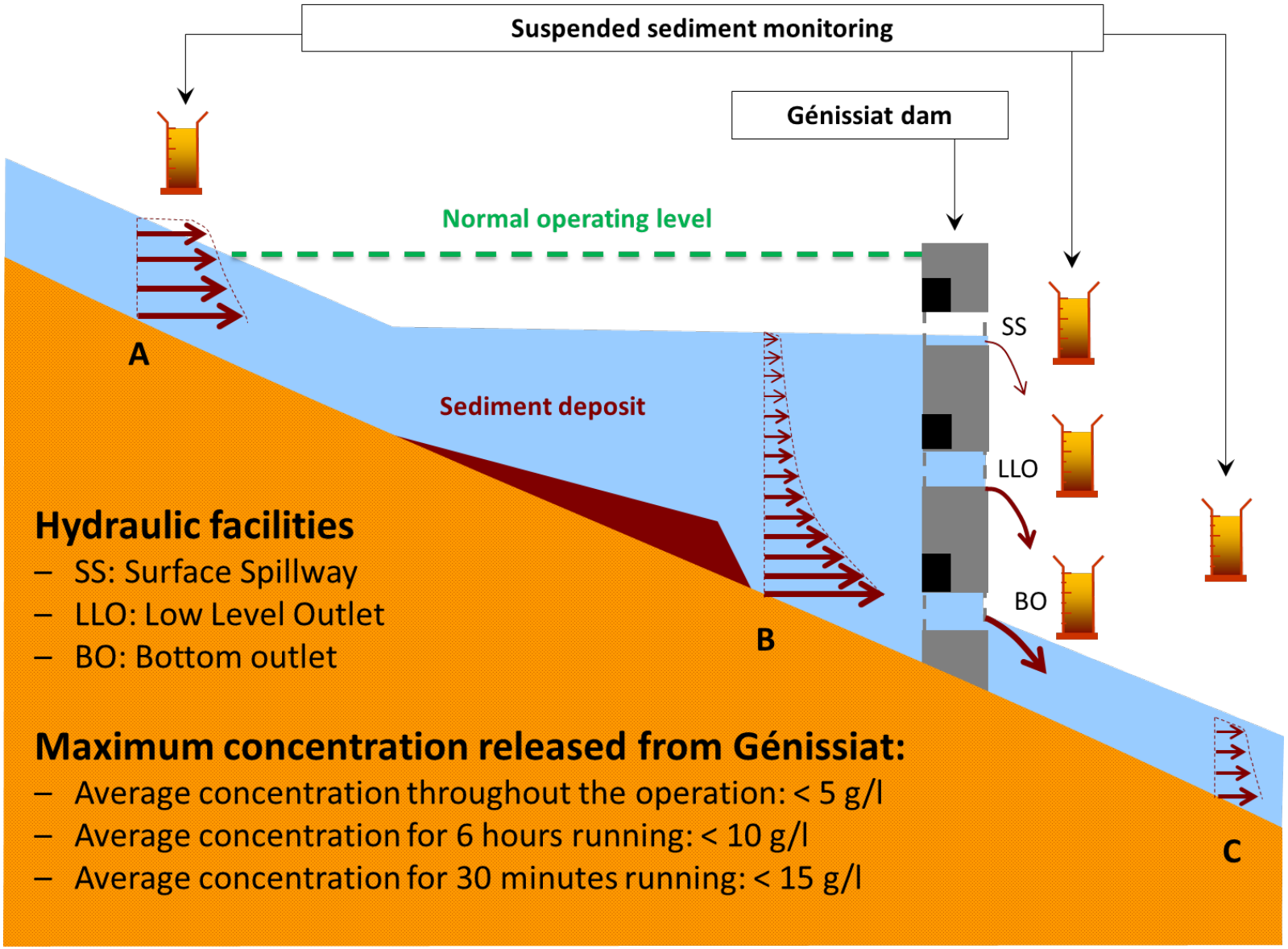
- Low Level Outlet: intake elevation at 285.90 m

Génissiat dam features

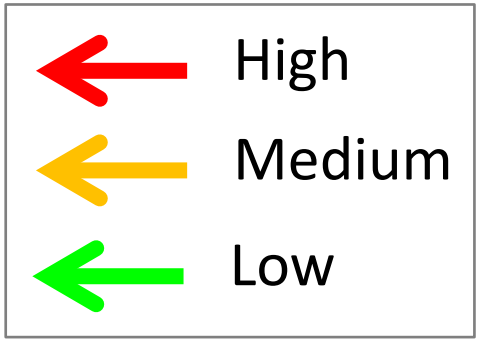


- Surface spillway: intake elevation at 316.80 m

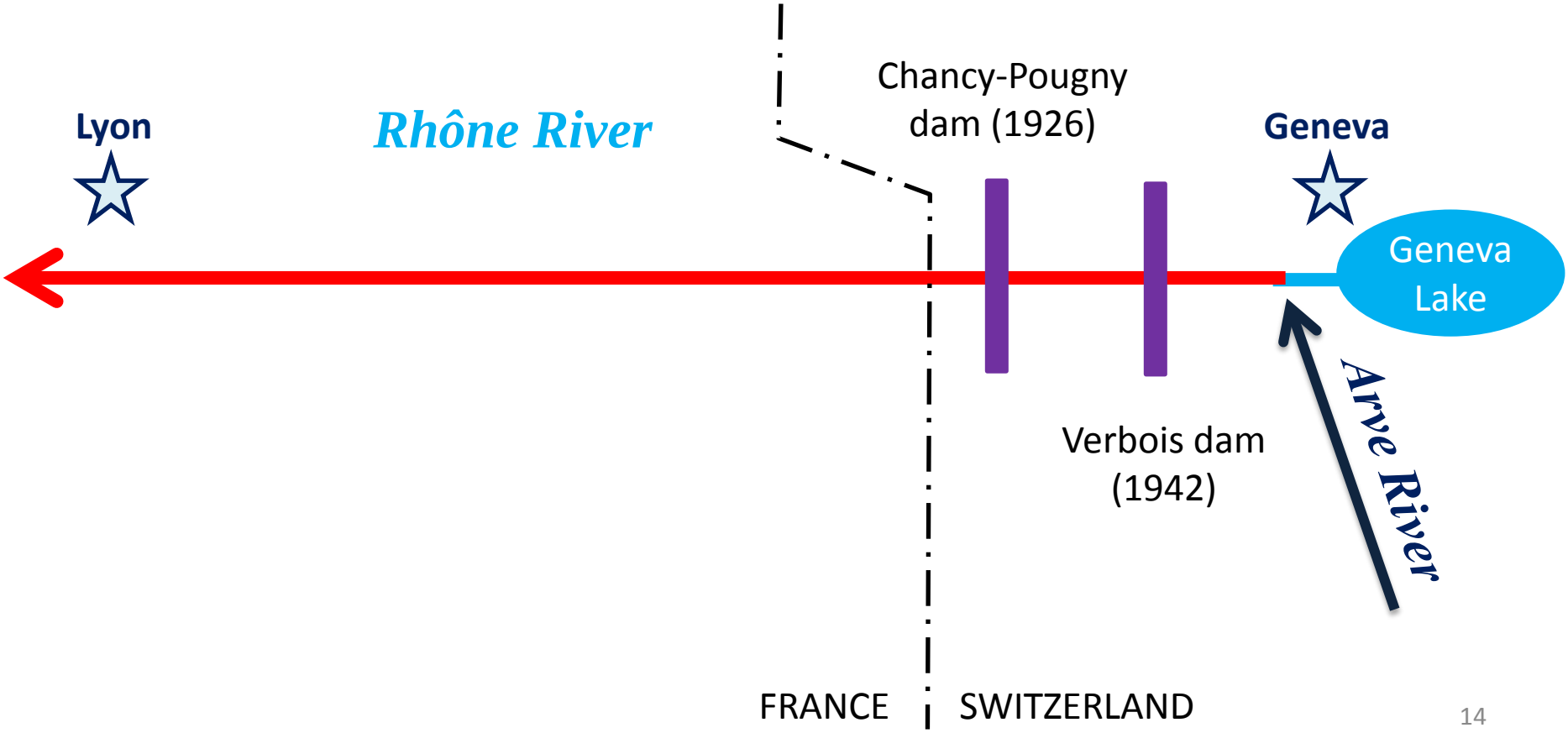
Eco-friendly flushing principle



Historical perspective of damages induced by flushing on aquatic life

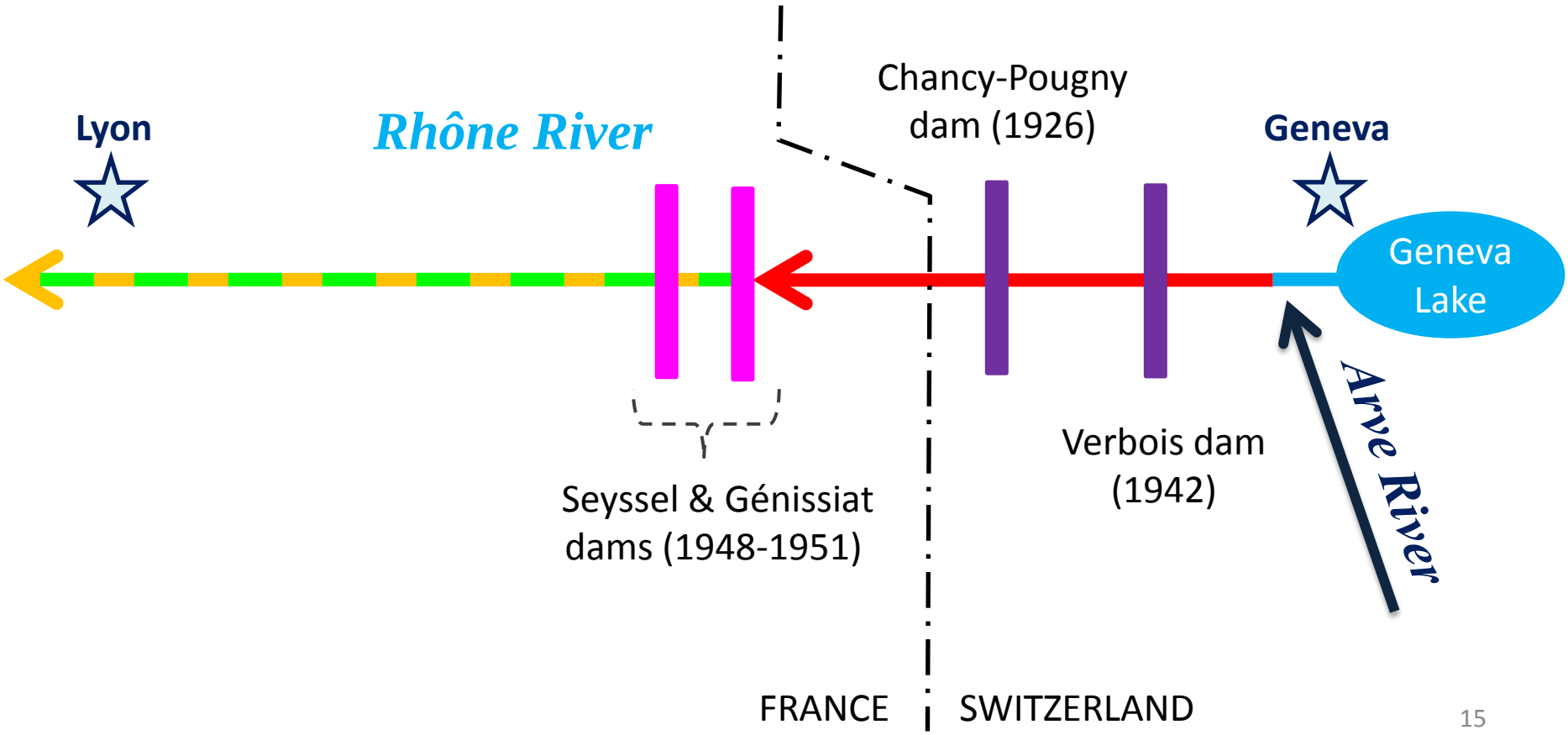


- Before 1948

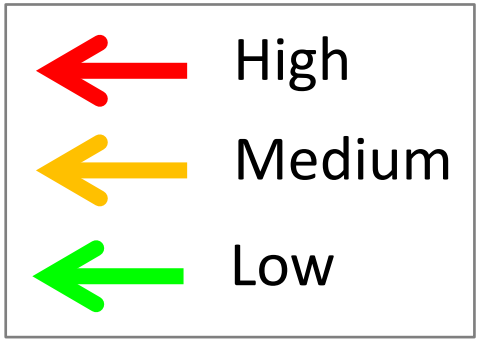


Historical perspective of damages induced by flushing on aquatic life

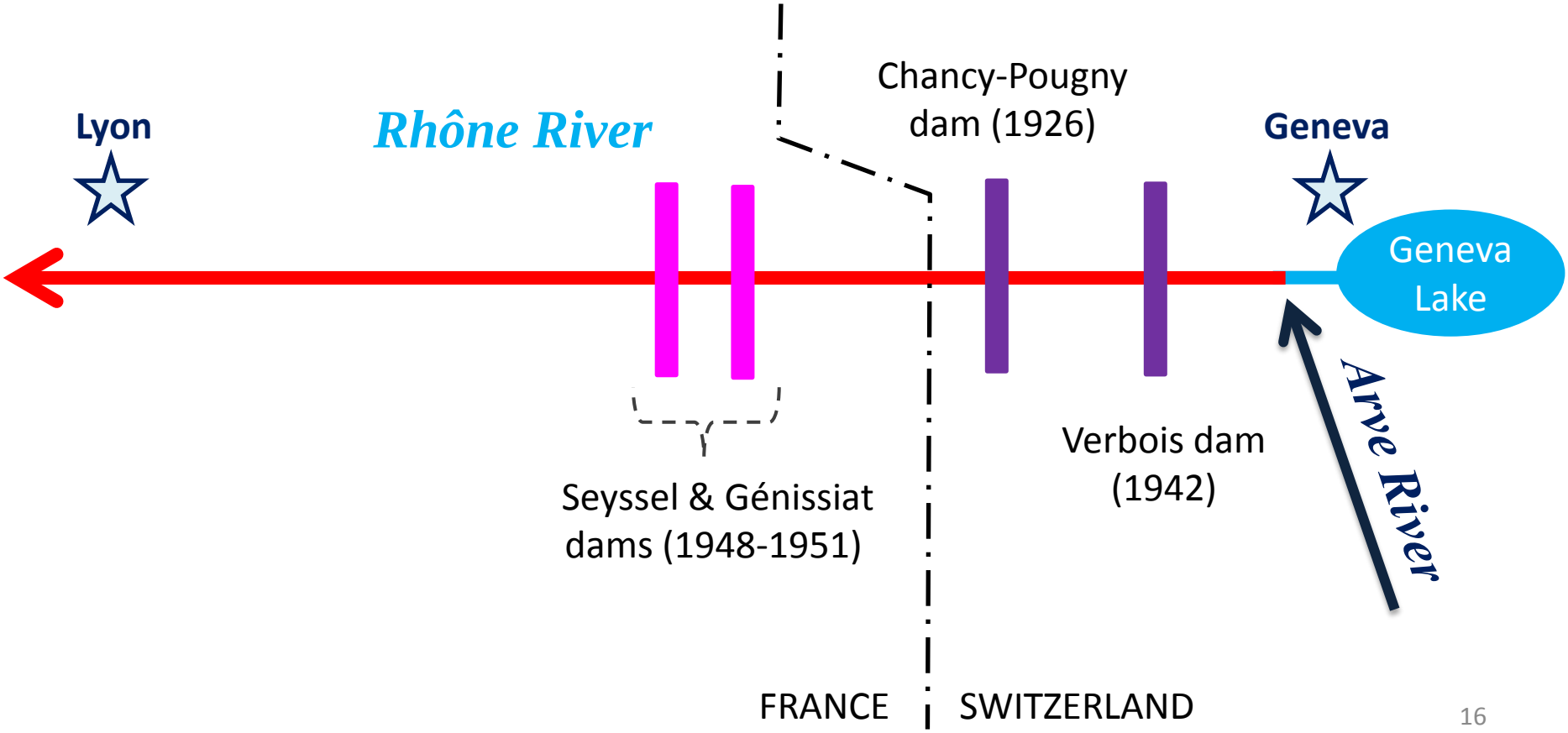
- 1949-1975



Historical perspective of damages induced by flushing on aquatic life



- 1978



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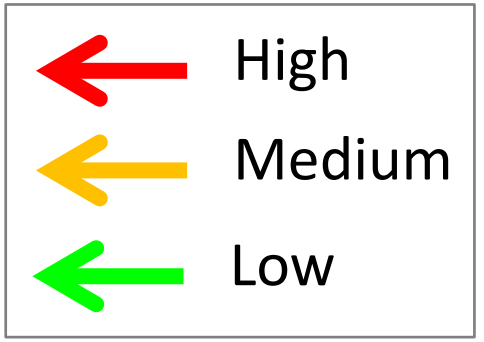
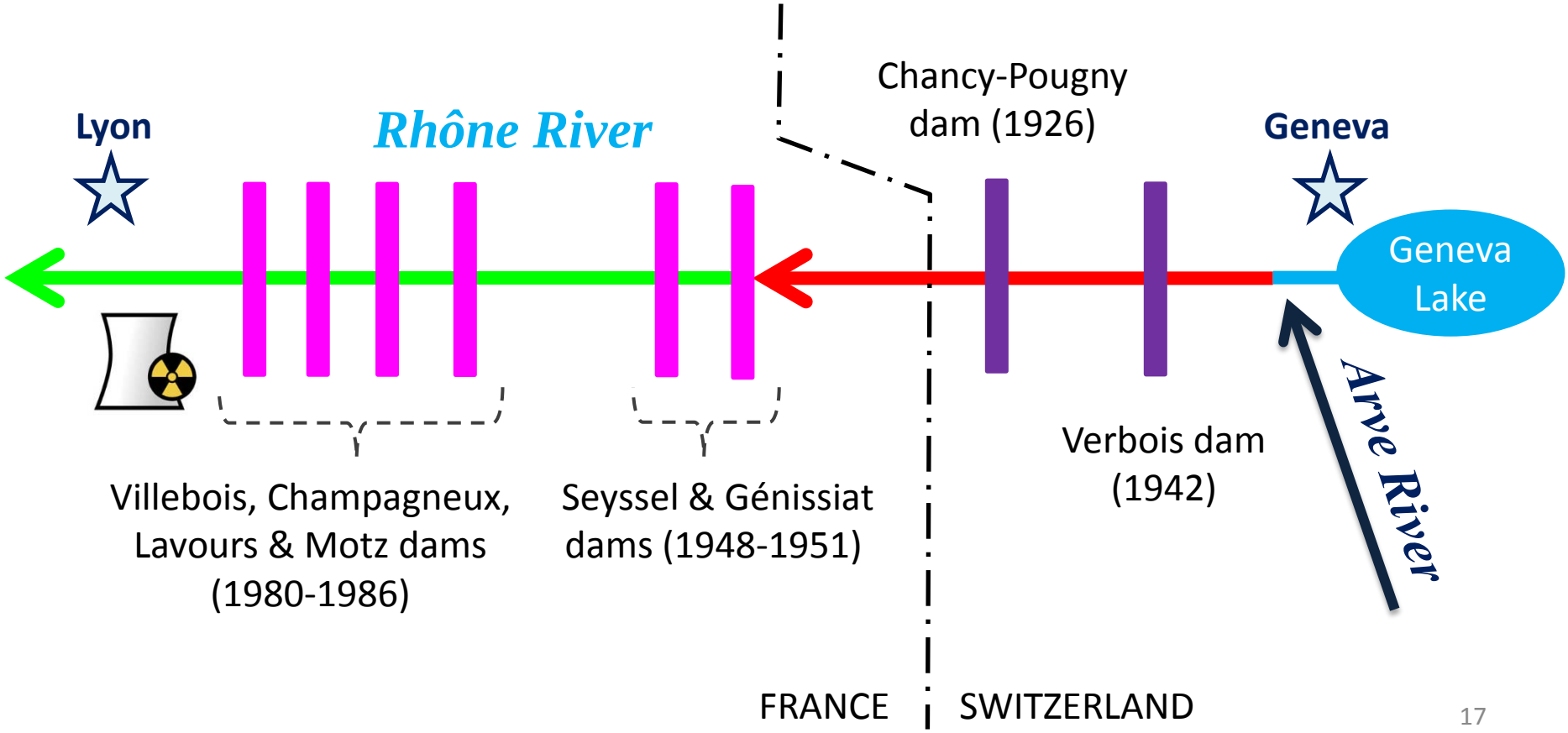
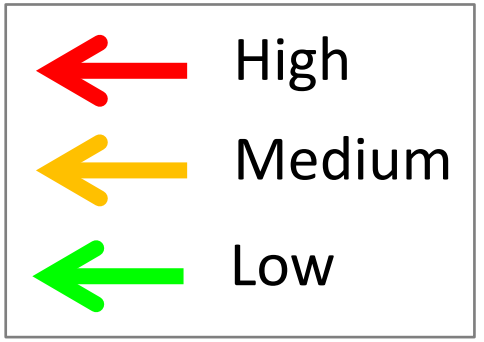


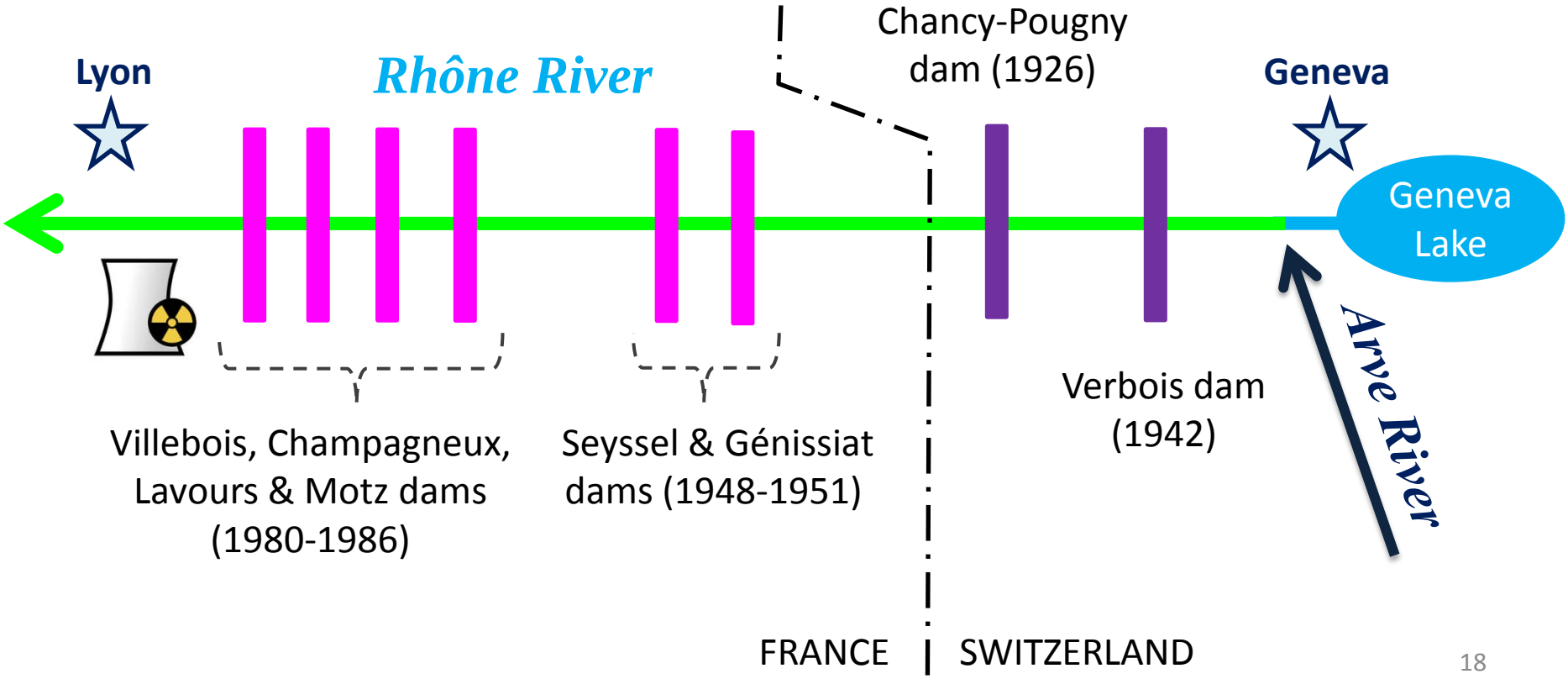
- 1981-2012



Historical perspective of damages induced by flushing on aquatic life



- So from now, WHY not managing the Upper Rhône River as a whole and from a consistent manner?



Toward a consistent and integrated management of sediments fluxes

- Constitution of a technical work group:
  - Composition: regulation authorities and dam operators from France and Switzerland
  - Scope: identify, evaluate and compare all credible scenarios regarding sediment fluxes management
- Consultation meetings with local stakeholders

Main strategies compared

1. Passive management of reservoirs
2. Routing of Arve River sediment-laden flows by:
   a) Partial drawdown of all reservoirs
   b) Supplying an extra discharge from Lake Geneva and by a slight reservoirs drawdown
3. Sediment flushing of reservoirs:
   a) With complete drawdown every 3, 5 or 10 years
   b) According to Eco-Friendly Flushing principle every 1, 2 or 3 years
4. Dredging of deposits accumulated in reservoirs
5. Combination of scenarios 2b, 3b and 4

Scenarios evaluation

- Feasibility, efficiency, impact, cost and constrains of scenarios have been evaluated and compared by considering following factors:
  - Technical
  - Economic
  - Environmental
  - Legislative
  - Societal

Scenario finally favored

1. Passive management of reservoirs
2. Routing of Arve River sediment-laden flows by:
   a) Supplying an extra discharge from Lake Geneva and by a slight drawdown of reservoirs
   b) Partial drawdown of all reservoirs
3. Sediment flushing of reservoirs:
   a) According to Eco-Friendly Flushing principle every 1, 2 or 3 years
   b) With complete drawdown every 3, 5 or 10 years
4. Dredging of deposits accumulated in reservoirs
5. **Combination of scenarios 2a, 3a and 4**

Conclusion

- Managing from a consistent and cooperative manner sediment issues in a trans-boundary basin is often a challenging but not impossible task
- Sediment management never relies on a unique and universal solution
- Multi-criteria analysis and stakeholders involvement are strong requirements to achieve a successful integrated management
- Eco-friendly flushing contributes to ensuring sediment continuity in reservoirs with acceptable impacts on river users and eco-systems
- To apply such strategy, field experiments and specific dam design and operation are required

Dziękuję za uwagę
Thank you for your attention
Merci pour votre attention