

Engaging Landowners in Limnology: The Fernan Lake Experience

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Background

- Fernan Lake is a small lake in northern Idaho adjacent to Coeur d'Alene, that is an important recreational resource and an important aesthetic asset to landowners.
- Blooms of toxic algae (cyanobacteria) related to excess nutrients result in no-contact advisories which decrease the lake's value.
- Landowners around Fernan are keen and willing to solve this problem and restore good water quality, providing a unique partnership opportunity between scientists and landowners.



Fernan Lake from the East.



Objectives

- To determine the amount of phosphorus entering, leaving, and remaining in the lake (P mass-balance) on an annual basis.
- Engage and integrate landowners using a reciprocal learning approach (figure 1).

Methods



Box on landowner property houses an automated stream sampler, which takes samples every day for the analysis of phosphorus.

PVC pipe contains water level logger which records stream depth every 15 minutes. These data are used to calculate discharge with a rating curve (figure 2).

Happy graduate student taking traditional cross-section velocity measurements to establish the discharge-rating curve (figure 2).

Lake phosphorus samples were collected with the help of a landowner to partition the distribution of the incoming load of P in the water column and the sediment.

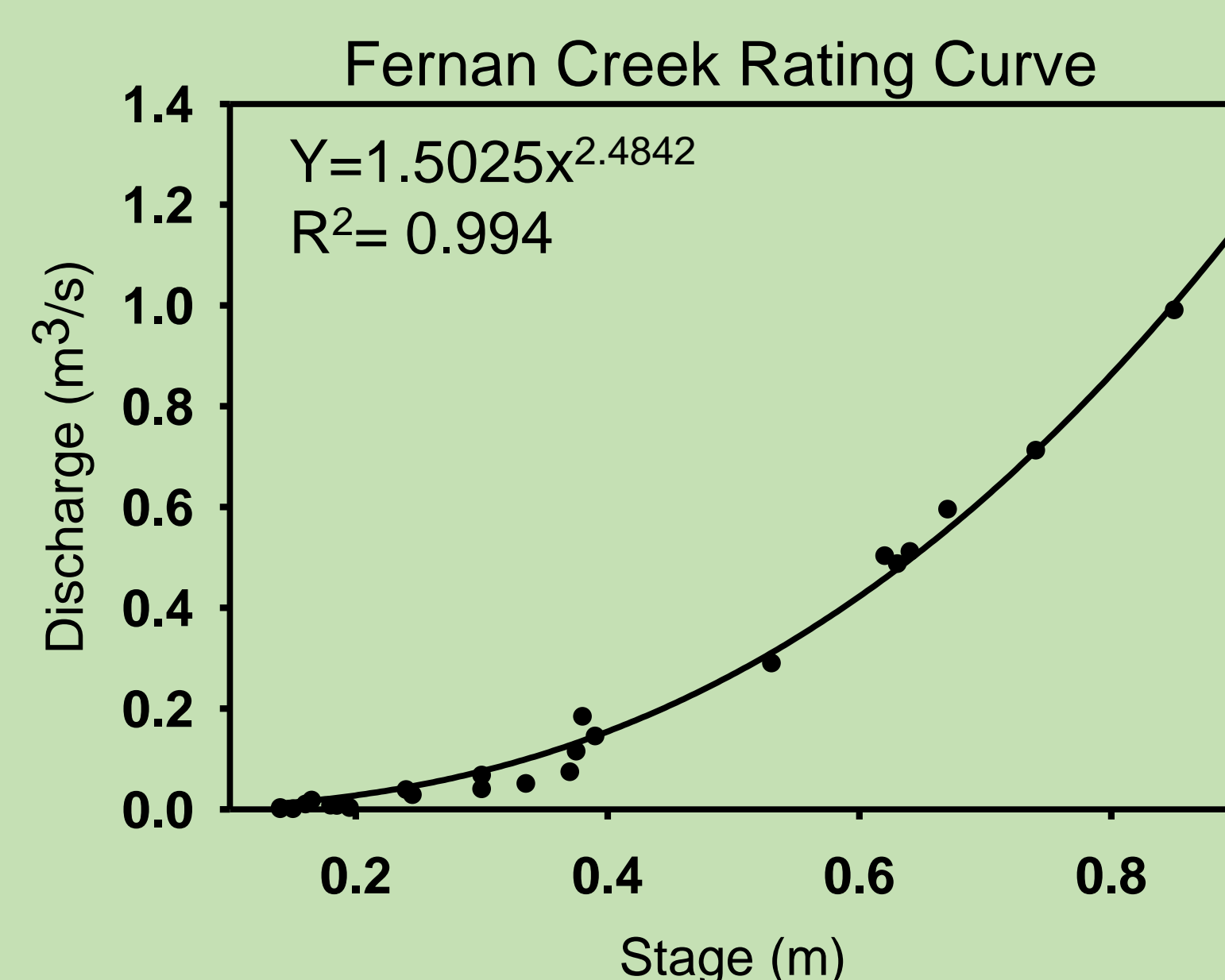


Figure 2: Rating curve showing discharge as a function of stage (water level) in Fernan Creek.



Bill Miller (R), a very involved landowner, used his personal boat to help us collect lake samples every two weeks.

Conclusions

- The mass balance showed a large load of P entered the lake, 69% of which was retained in the lake.
- This P contributes to the blooms of toxic cyanobacteria in the lake.
- We are exploring the timing of the inundation of the wetlands at the inlet in relation to operation of the dam and seasonal discharge to reduce the P retained in the lake.



Dam at outlet of Fernan Lake.

June 2014

April 2015

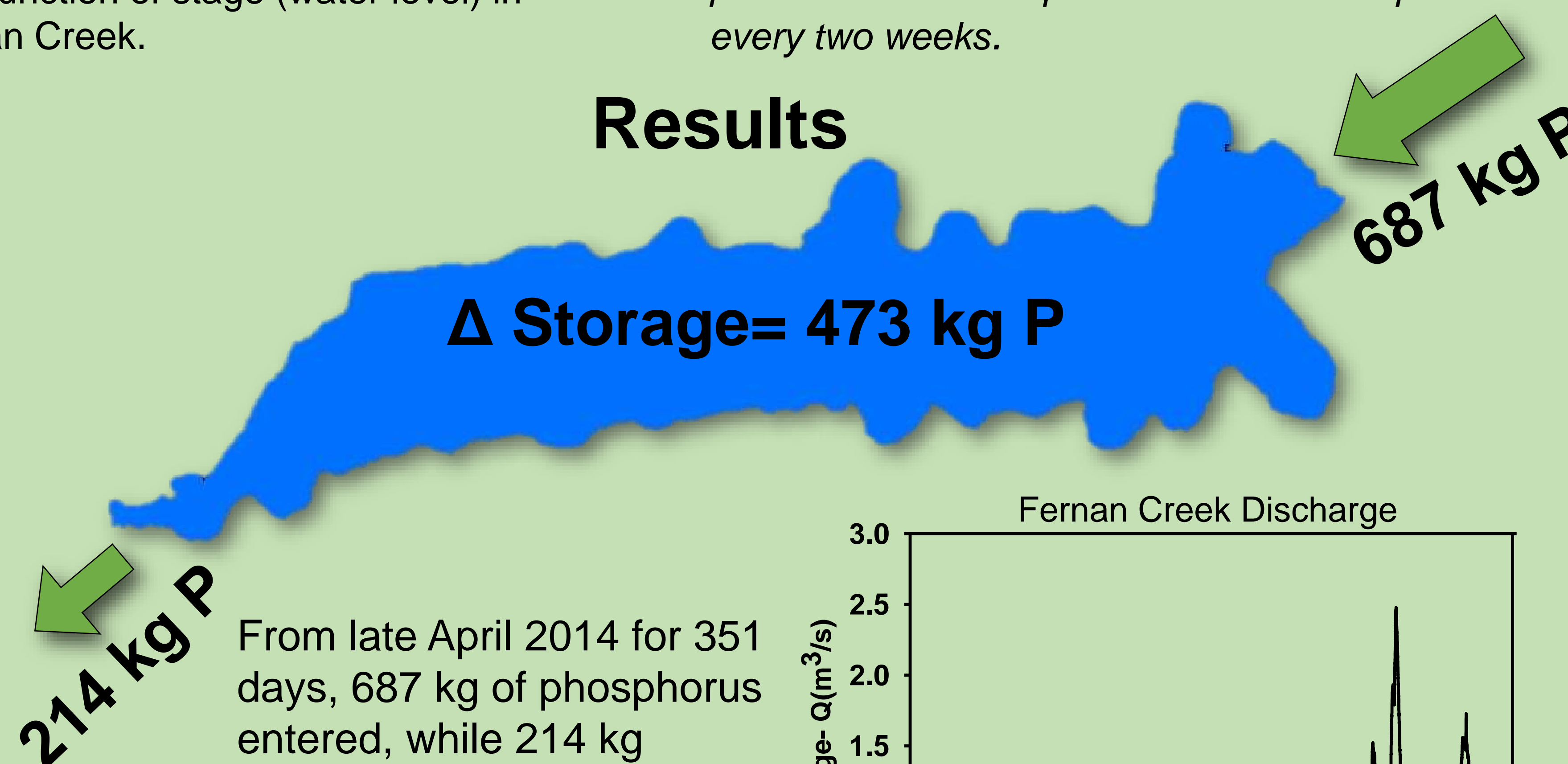


- Engaging with landowners throughout this study was a valuable experience and beneficial for both scientists and landowners.
- Landowners had constant close contact with scientists and learned the science and its progress.
- Scientists gained the trust of locals, background knowledge and access to sites.



Landowners observing lake sampling through the ice.

Results



From late April 2014 for 351 days, 687 kg of phosphorus entered, while 214 kg exited, and 473 kg remained in the lake. The lake retained 69% of the phosphorus load. Load was dependent on discharge which showed high seasonal variation (figure 3).

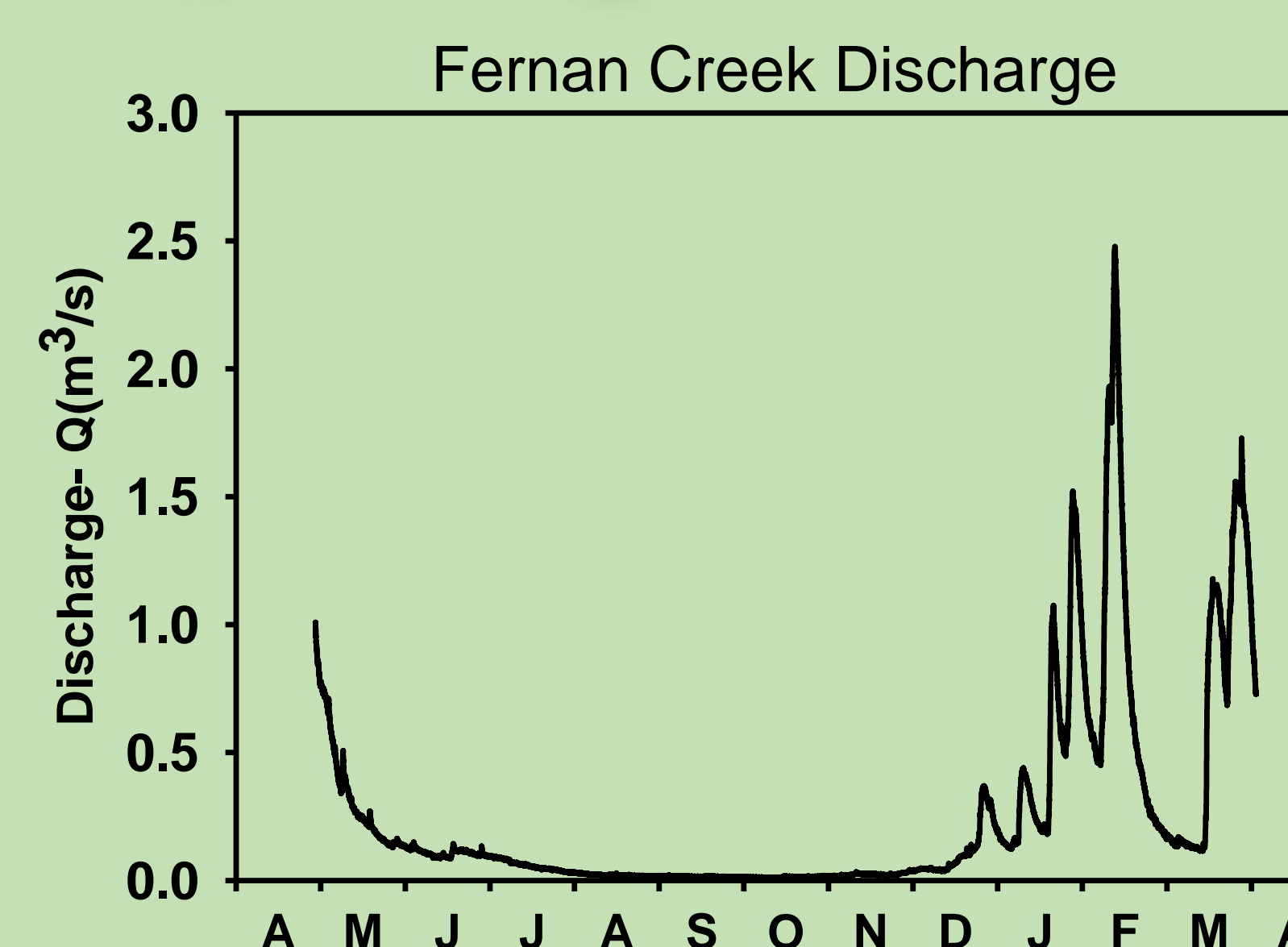


Figure 3: Hydrograph of discharge from Fernan Creek for 351 days.

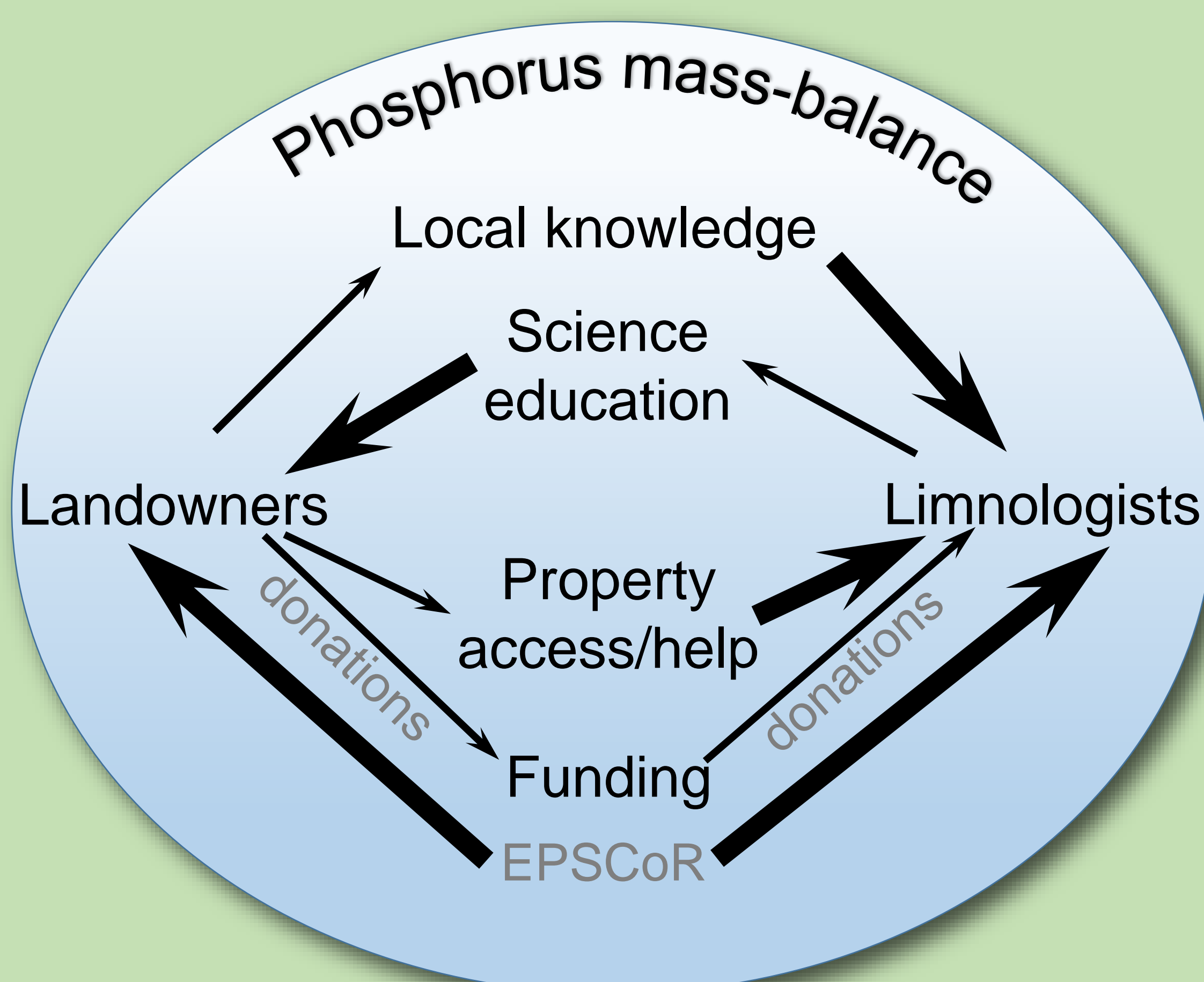


Figure 1: Model of reciprocal learning engaging landowners and limnologists in mass-balance science. Thickness of arrows represents proportionality of effort or gain for each.

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