

Instream Flow Protection:

**An overview of legal, planning,
financial, and scientific support
for state programs**

Presented by
Mary Davis, Ph.D., Director
TNC Southern Freshwater Program

Southern Instream Flow Network



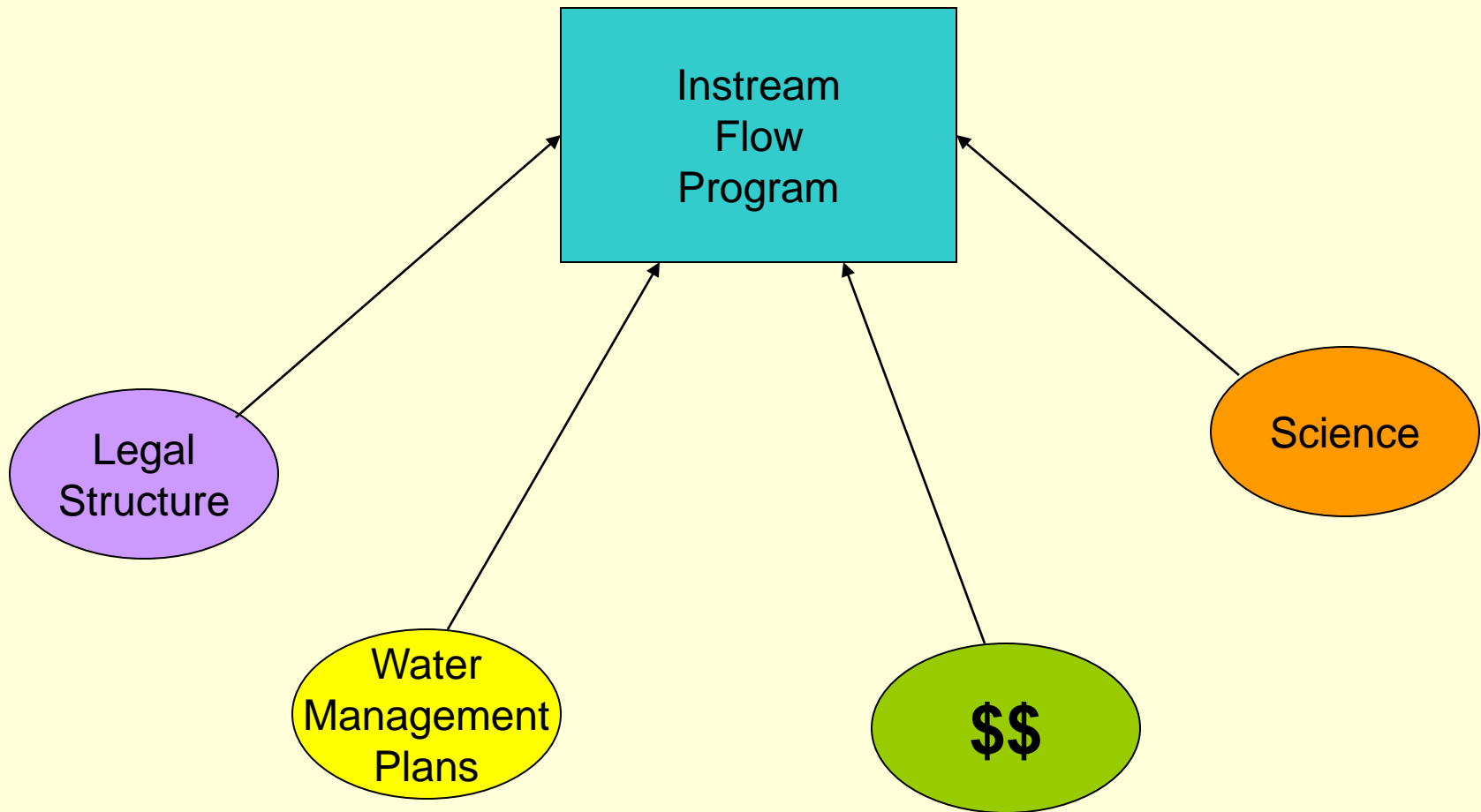
Basics of Instream Flow Protection

Assumption: The 'gold standard' for state instream flow programs is the sustainable protection of environmental flows.

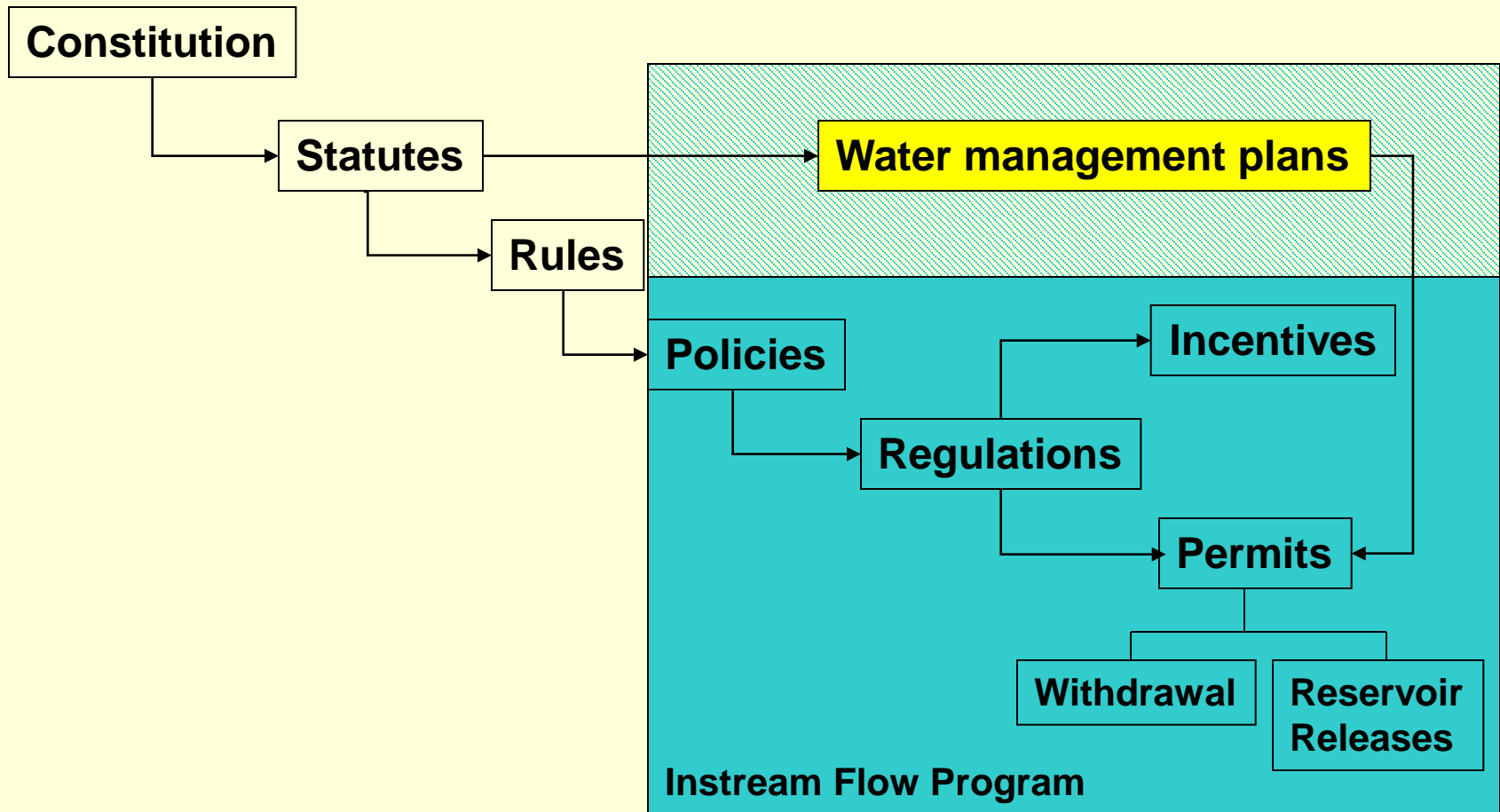
Instream Flow Program responsibilities may include :

- 1. developing rules and regulations to administer state laws for instream flow protection;**
- 2. selecting appropriate methods to determine instream flow criteria;**
- 3. obtaining and evaluating information on instream flow requirements;**
- 4. setting instream flow criteria;**
- 5. assisting planning agencies with incorporation of instream flow criteria into water management plans;**
- 6. using water allocation guidelines or limits from water management plans to inform permitting decisions;**
- 7. issuing water use permits;**
- 8. enforcing permit instream flow limits;**
- 9. monitoring and evaluating the program effectiveness;**
- 10. managing adaptive management issues;**
- 11. advising on development of water conservation, drought, and other water management plans; and**
- 12. informing the public and building awareness about instream flow issues.**

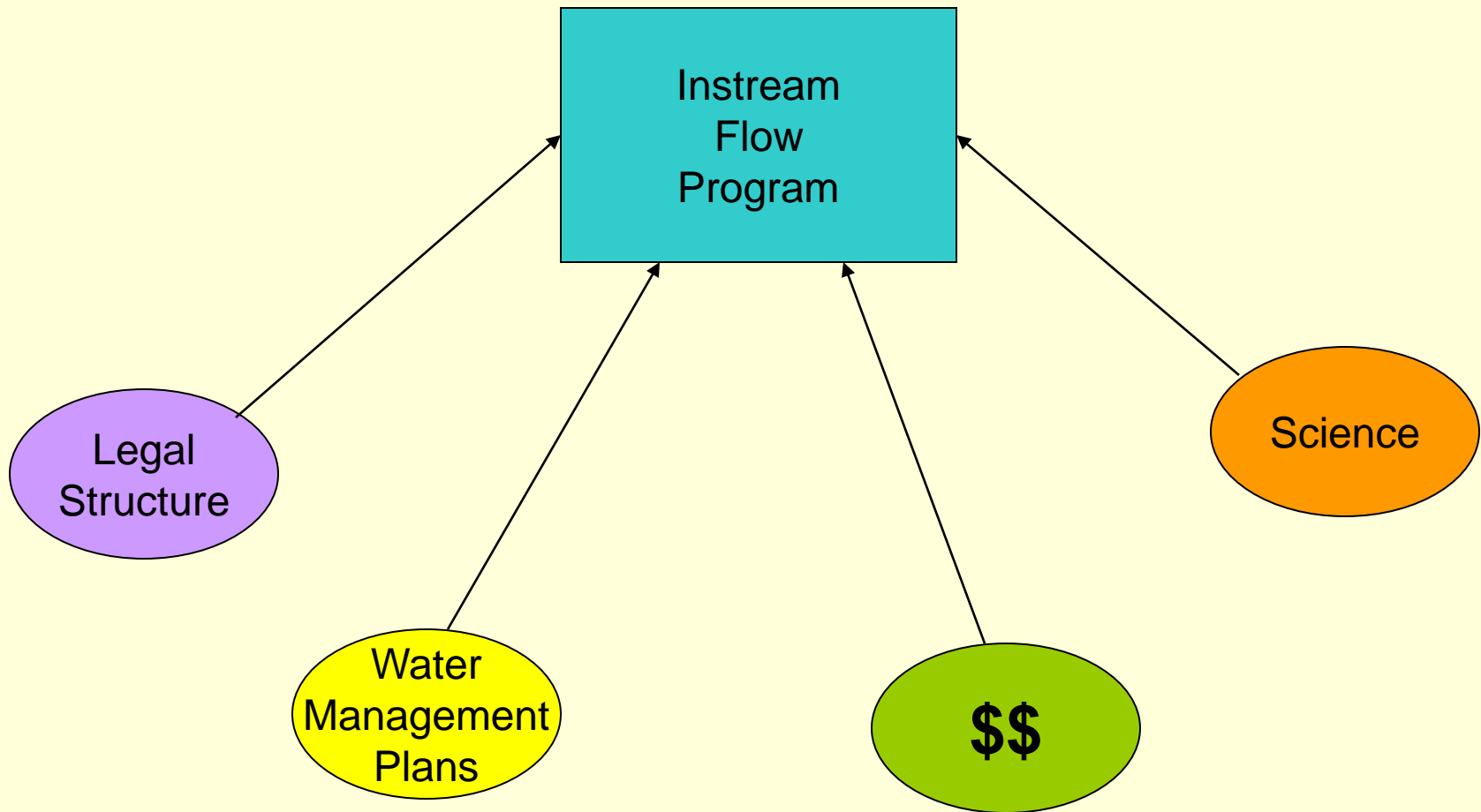
Supporting Elements of State Instream Flow Protection Programs



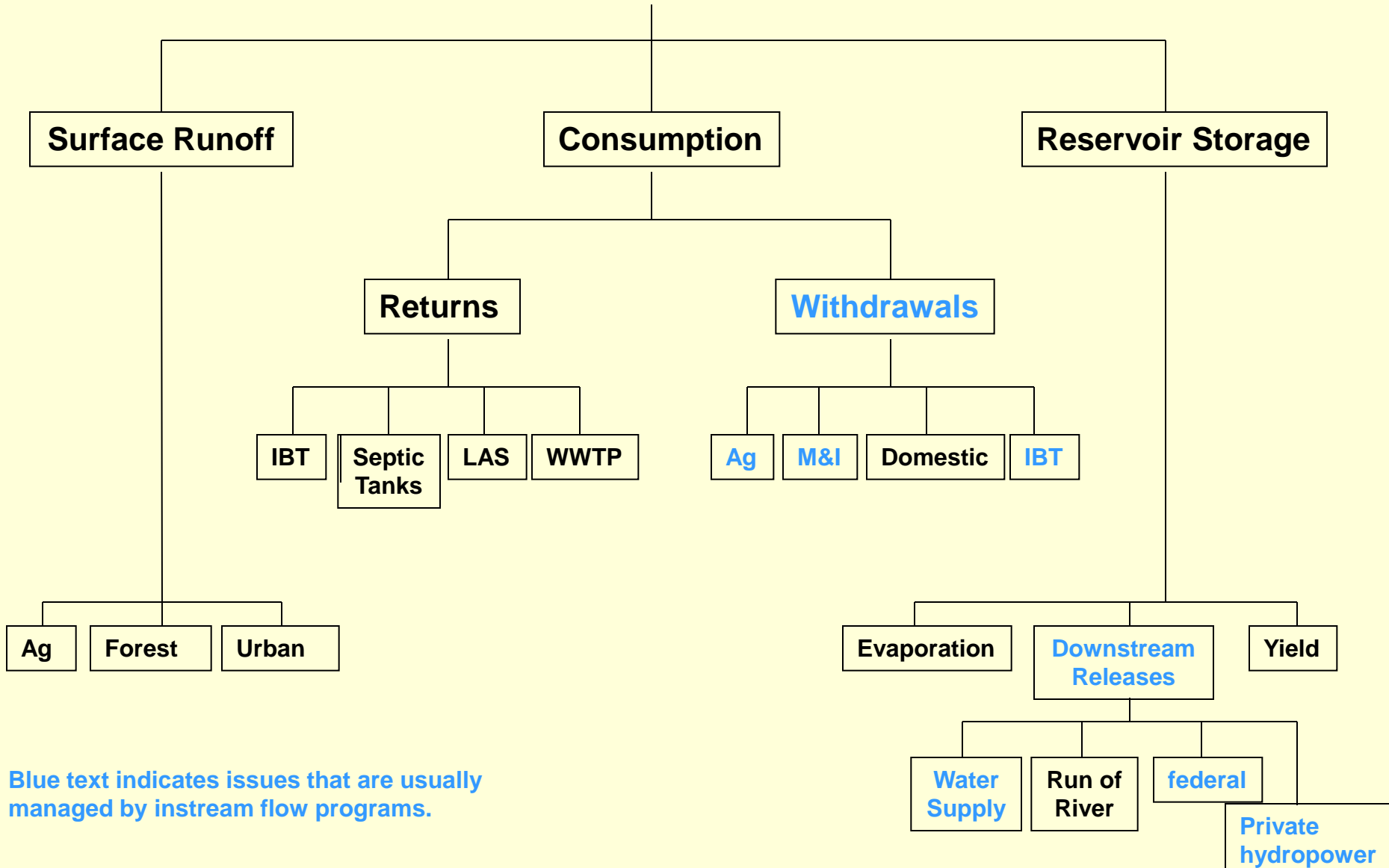
Legal Structure for State Programs to Protect and Manage Instream Flows



Supporting Elements of State Instream Flow Protection Programs



Instream Flow Issues Addressed In Water Management Plans



Water Management Plan Decision Support System

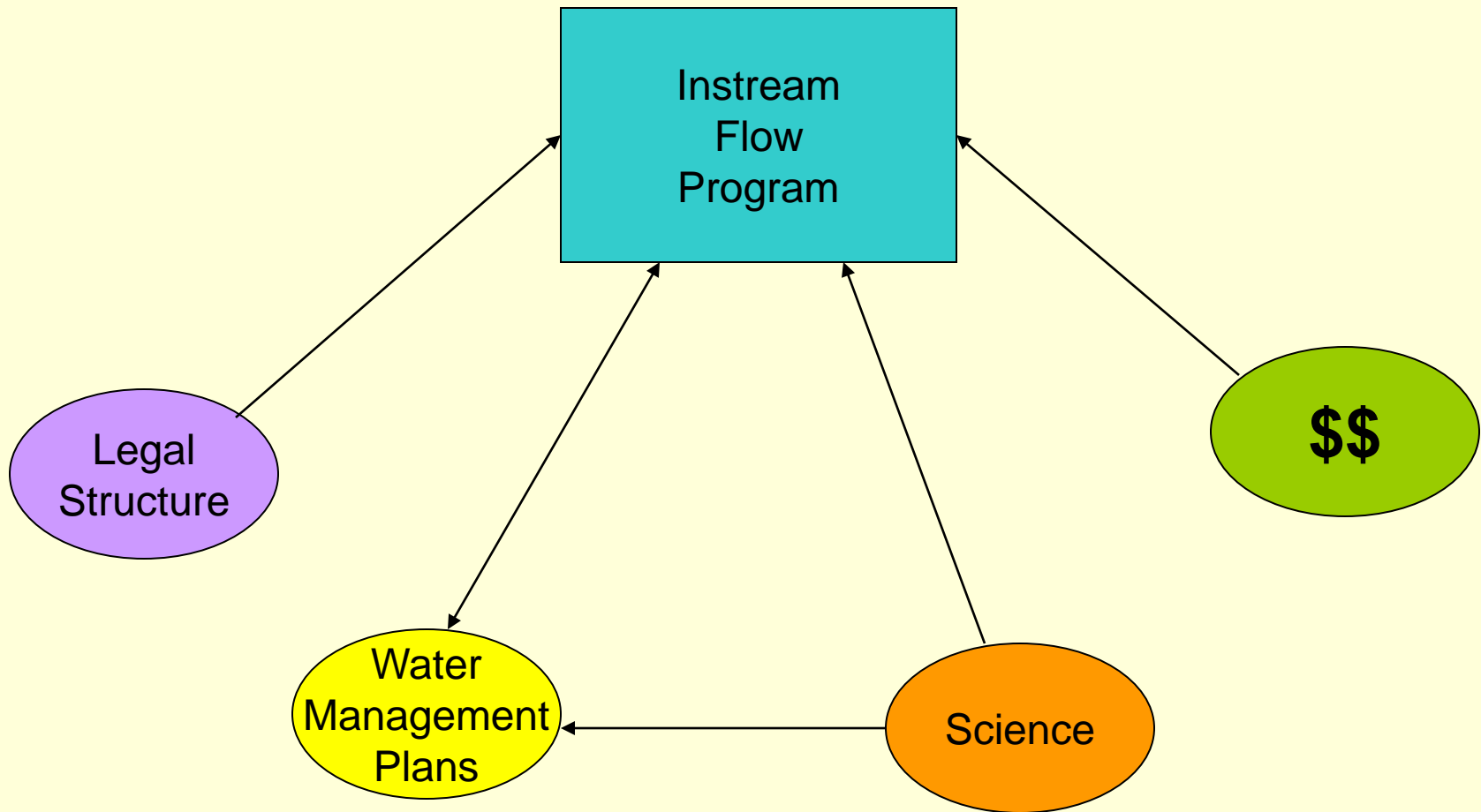
A Water Management Plan should be based on a *watershed hydrologic* model that can help answer the following questions:

1. How much water is there in the river? (Total flow)
2. How much water needs to stay in the river? (**Instream flow criteria**)
3. How much water can be safely consumed? (Consumptive limit)

Total flow = Instream flow + Consumptive limit + Safety factor

How can current and future water use be managed to stay within the Consumptive limit? (Watershed water management plan)

Supporting Elements of State Instream Flow Protection Programs



Instream Flow Criteria

- **Criteria (or standards)** are environmental conditions that are flow 'goals' that must be met on a consistent basis.
- These preferably address a range of flow parameters and ecological conditions
- Can apply statewide, to classes of rivers, or individual rivers

Example Instream Flow Criteria

NF Shenandoah- Cootes Store Virginia (MAF 196 CFS)

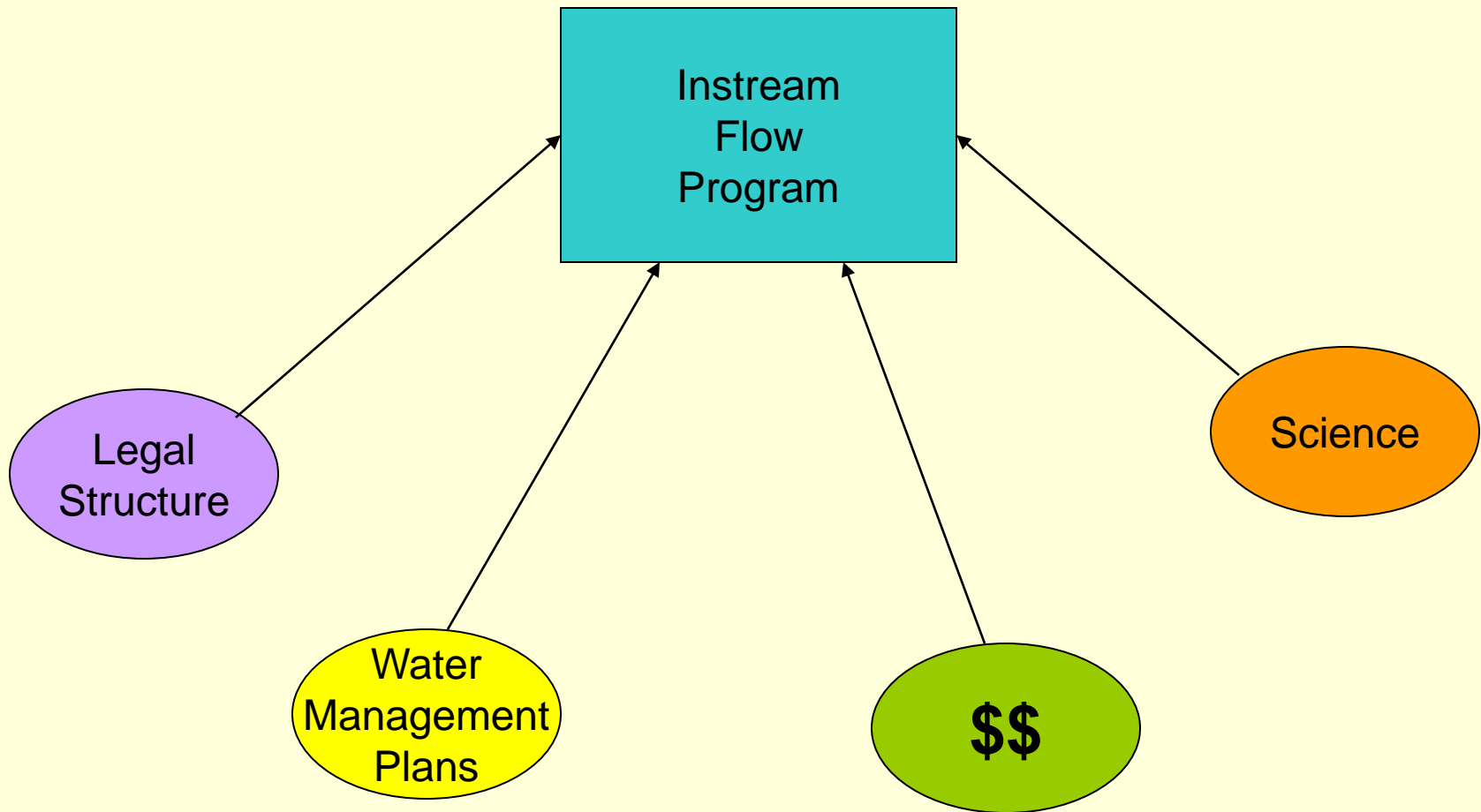
Exceed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
10	438.0	682.5	835.3	720.0	529.4	240.0	105.0	199.2	113.0	154.4	242.0	344.5
20	278.2	403.0	490.0	421.0	330.8	122.0	47.0	87.0	49.0	59.0	123.4	185.0
30	174.6	270.0	337.9	297.0	228.0	86.0	32.0	40.6	27.0	30.0	71.0	116.0
40	120.8	198.0	262.0	223.0	164.8	63.0	23.0	24.0	17.0	17.0	40.0	83.0
50	90.0	152.0	211.0	177.0	123.0	48.0	18.0	14.0	12.0	12.0	25.0	57.0
60	62.0	107.0	169.8	142.0	98.0	38.0	15.0	9.0	6.9	8.8	17.0	38.0
70	45.0	74.0	127.1	110.0	77.0	30.0	12.0	5.7	3.8	6.0	11.0	25.0
80	28.0	45.0	99.4	89.0	57.0	22.0	8.3	3.6	2.2	4.4	8.1	11.0
90	15.0	21.5	69.0	66.0	39.0	17.0	5.0	2.0	1.4	2.2	4.5	6.0

Comprehensive Instream Flow Criteria

Table 2 Relationship between IHA parameters and Low Flows 2000 statistics

Group	IHA full list	IHA short list	Low Flows 2000 list
1	December flow (m^3s^{-1})	mean January flow (m^3s^{-1})	mean January flow (m^3s^{-1})
1	January flow (m^3s^{-1})		
1	February flow (m^3s^{-1})		
1	March flow (m^3s^{-1})	mean April flow (m^3s^{-1})	mean April flow (m^3s^{-1})
1	April flow (m^3s^{-1})		
1	May flow (m^3s^{-1})		
1	June flow (m^3s^{-1})	mean July flow (m^3s^{-1})	mean July flow (m^3s^{-1})
1	July flow (m^3s^{-1})		
1	August flow (m^3s^{-1})		
1	September flow (m^3s^{-1})	mean October flow (m^3s^{-1})	mean October flow (m^3s^{-1})
1	October flow (m^3s^{-1})		
1	November flow (m^3s^{-1})		
2	1 day minimum flow	mean of annual minimum 7 day flow (m^3s^{-1})	Q_{95} (m^3s^{-1})
2	3 day minimum flow		
2	7 day minimum flow		
2	30 day minimum flow		
2	90 day minimum flow		
2	1 day maximum flow	mean of annual maximum 7 day flow (m^3s^{-1})	Q_5 (m^3s^{-1})
2	3 day maximum flow		
2	7 day maximum flow		
2	30 day maximum flow		
2	90 day maximum flow		
3	mean julian day of minimum flow		
3	mean julian day of maximum flow		
4	number of times flow rate rises above 25th flow percentile	mean number of times per year flow exceeds Q_{25}	BFI
4	number of times flow rate drops below 75th flow percentile	mean number of times per year flow is less than Q_{75}	
4	mean duration of high pulses	Mean number of flow rises	
4	mean duration of low pulses		
5	number of flow rises		
5	number of flow falls		
5	mean rise rate	mean fall rate - mean different between falling flows ($m^3s^{-1}d^{-1}$)	BFI
5	mean fall rate		

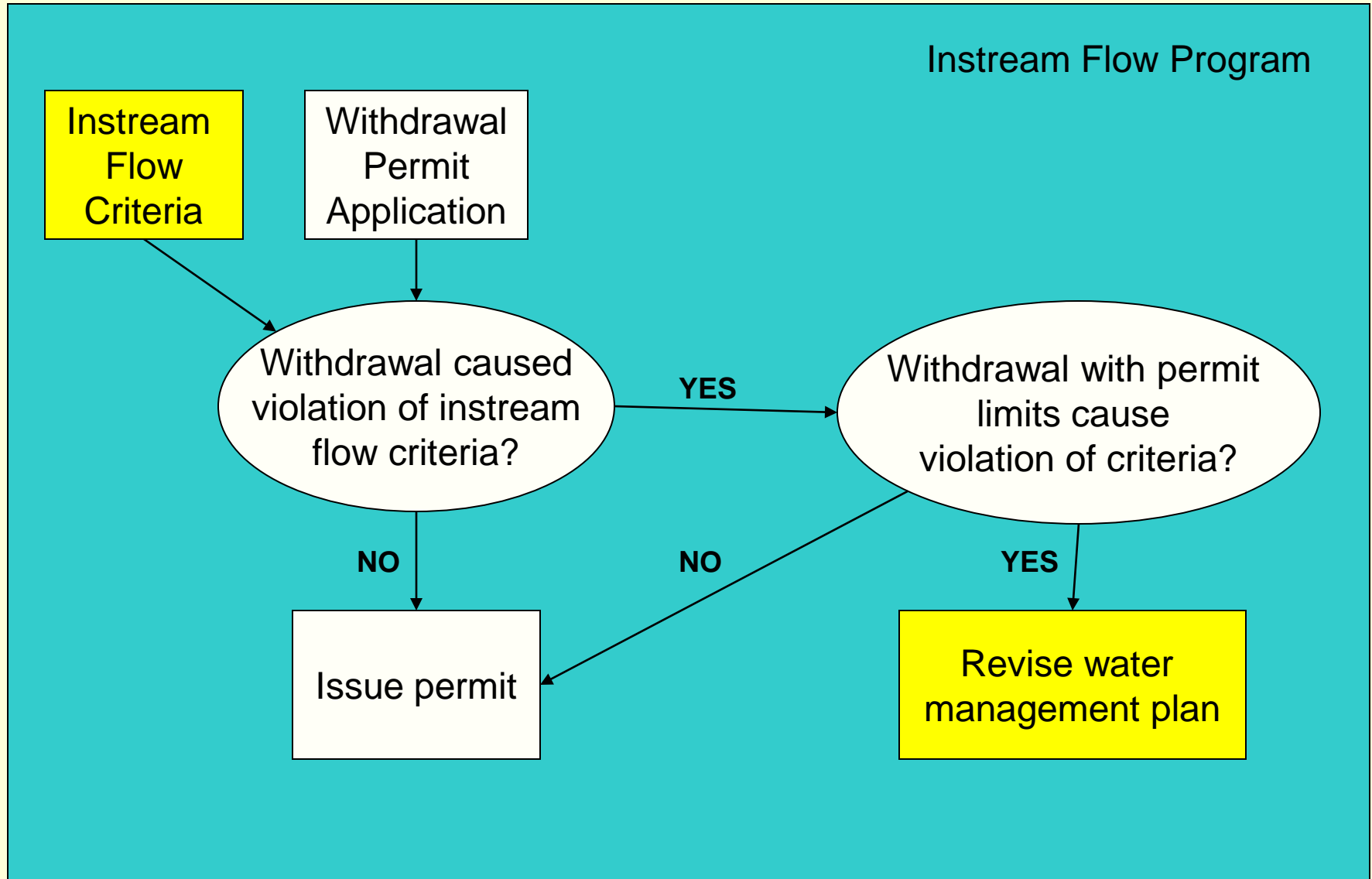
Supporting Elements of State Instream Flow Protection Programs



Permit Limits

- **Limits (& Reservoir Operations)** are quantities of water that are allowed to be withdrawn or the specific requirements for releases at any particular time step.
- These are ‘operating rules’ and often are the ‘permit conditions.’

Comprehensive Ecologically Based Instream Flow Management

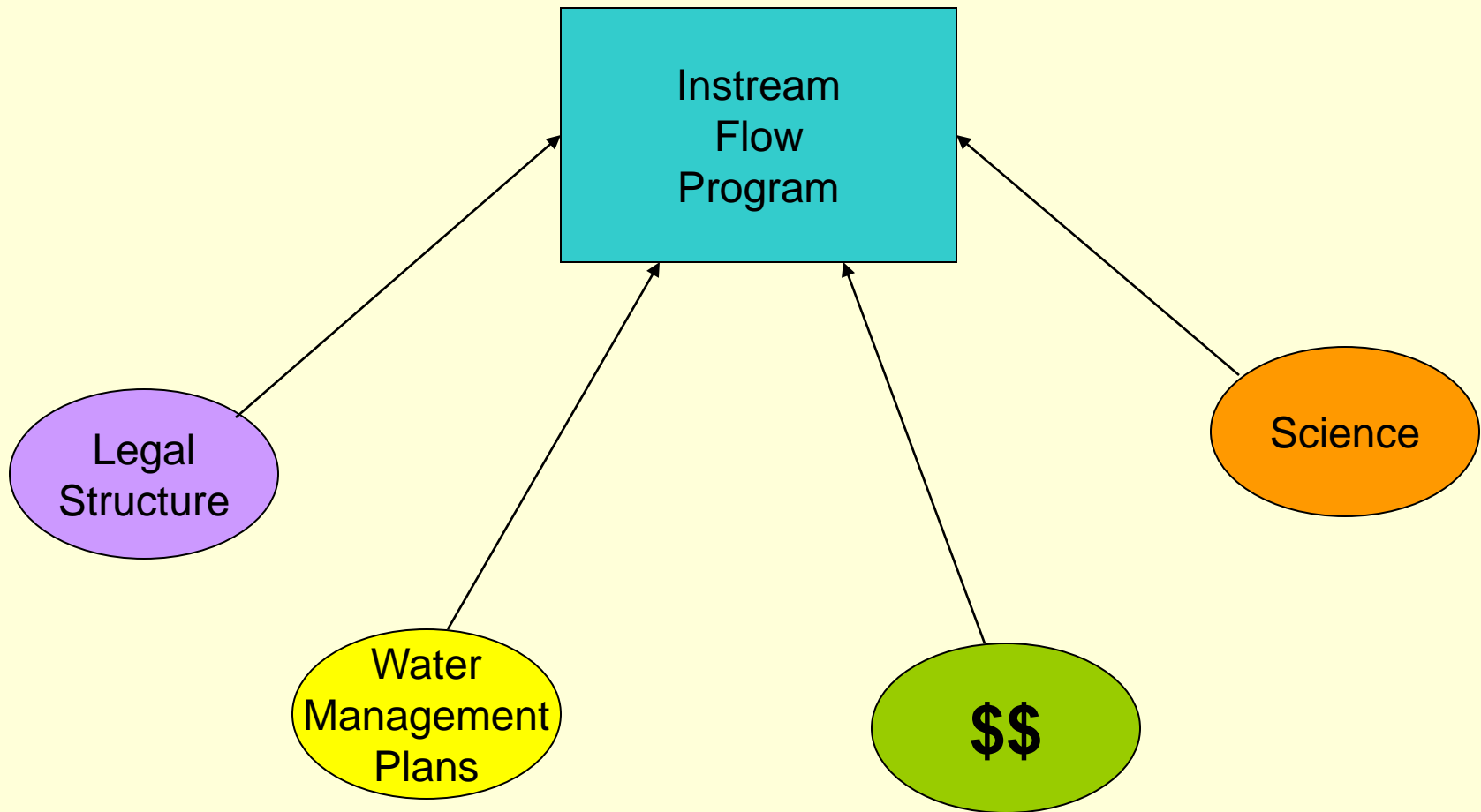


Example Withdrawal Permit Limits

GROUNDWATER WITHDRAWALS OPERATIONS CHART Well No. 1 — 0.86 MGD (600 gpm); Well No. 2 — 0.98 MGD (680 gpm)

• Month	Shut Off	Alternate Day Pumping	Daily Pumping
• January	< 18.7 cfs	18.7 – 44.5 cfs	> 44.5 cfs
• February	< 18.7 cfs	18.7 – 44.5 cfs	> 44.5 cfs
• March	< 18.7 cfs	18.7 – 44.5 cfs	> 44.5 cfs
• April	< 18.7 cfs	18.7 – 44.5 cfs	> 44.5 cfs
• May	< 18.7 cfs	18.7 – 44.5 cfs	> 44.5 cfs
• June	< 18.7 cfs	18.7 – 29.8 cfs	> 29.8 cfs
• July	< 18.7 cfs	18.7 – 29.8 cfs	> 29.8 cfs
• August	< 18.7 cfs	18.7 – 29.8 cfs	> 29.8 cfs
• September	< 18.7 cfs	18.7 – 29.8 cfs	> 29.8 cfs
• October	< 18.7 cfs	18.7 – 29.8 cfs	> 29.8 cfs
• November	< 18.7 cfs	18.7 – 44.5 cfs	> 44.5 cfs
• December	< 18.7 cfs	18.7 – 44.5 cfs	> 44.5 cfs

Supporting Elements of State Instream Flow Protection Programs

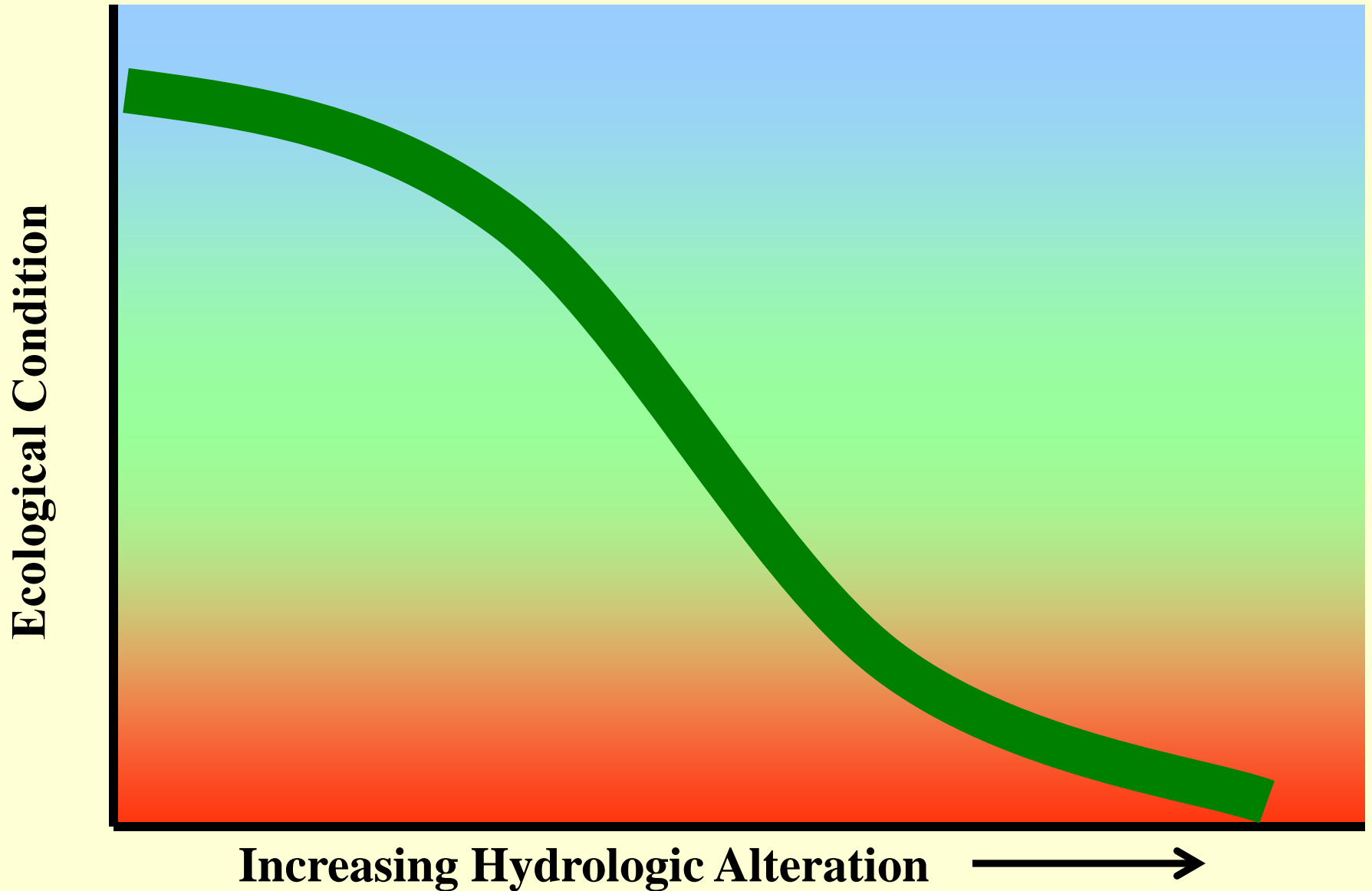


A dedicated funding source to support instream flow programs for:

- **Studies to support instream flow criteria**
- **Implementation of program**
- **Enforcement of program**
- **Monitoring for adaptive management**
- **Education and outreach**

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Flow : Ecology Response Curve



Instream Flow Criteria

