Foothill Yellow-Legged Frog Reproduction and Black Cottonwood Initiation

Modeling riparian species' responses to flows on the regulated reach of the Trinity River

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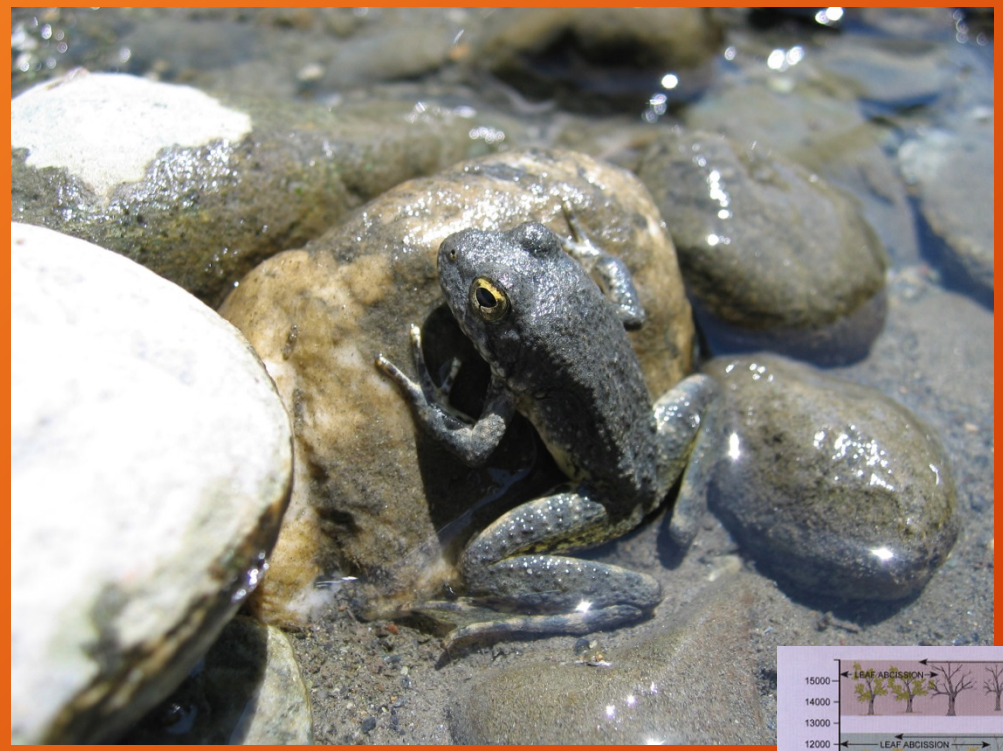
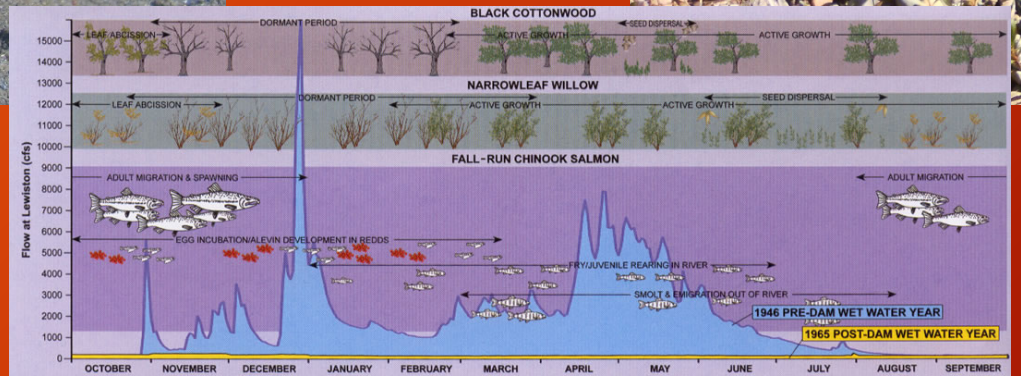
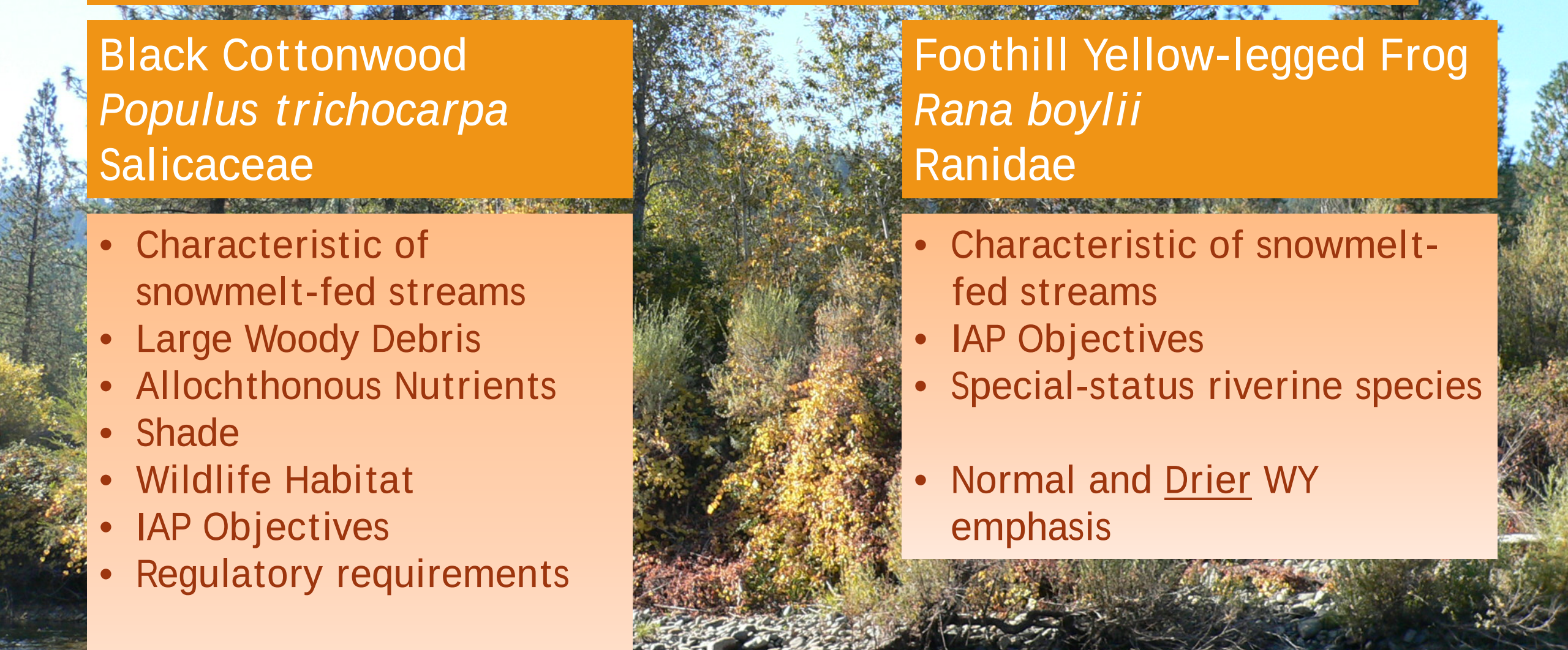
FYF and Black Cottonwood recruitment processes require specific flow conditions at aquatic-terrestrial edges: banks, bars, and floodplains





natural riparian/riverine processes occur, provides benefits to salmonids, and supports programmatic objectives



Black Cottonwood
Populus trichocarpa
Salicaceae

- Characteristic of snowmelt-fed streams
- Large Woody Debris
- Allochthonous Nutrients
- Shade
- Wildlife Habitat
- IAP Objectives
- Regulatory requirements

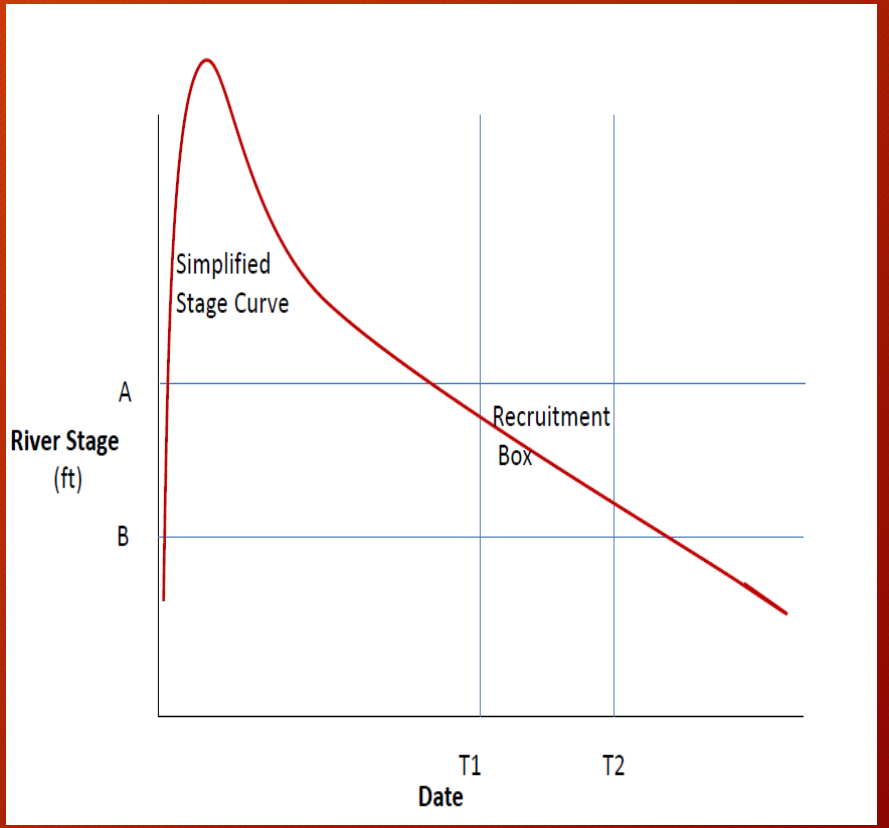
Foothill Yellow-legged Frog
Rana boylii
Ranidae

- Characteristic of snowmelt-fed streams
- IAP Objectives
- Special-status riverine species

- Normal and Drier WY emphasis

Black Cottonwood

- Recruitment models can be explained by a simplified "recruitment box model" (Mahoney and Rood 1998)
- There is more to riparian vegetation modeling than black cottonwood recruitment-- channelbed scour and inundation cause mortality; other riparian species have different seed dispersal periods



Black Cottonwood

- TRRP has two models presently available. TARGETS and SRH-Veg
- TARGETS was the first Trinity-Specific model used to evaluate annual hydrograph recommendations and whether recommendations would achieve the desired cottonwood recruitment
- This presentation will focus on modeling Black Cottonwood initiation with TARGETS

Black Cottonwood- TARGETS

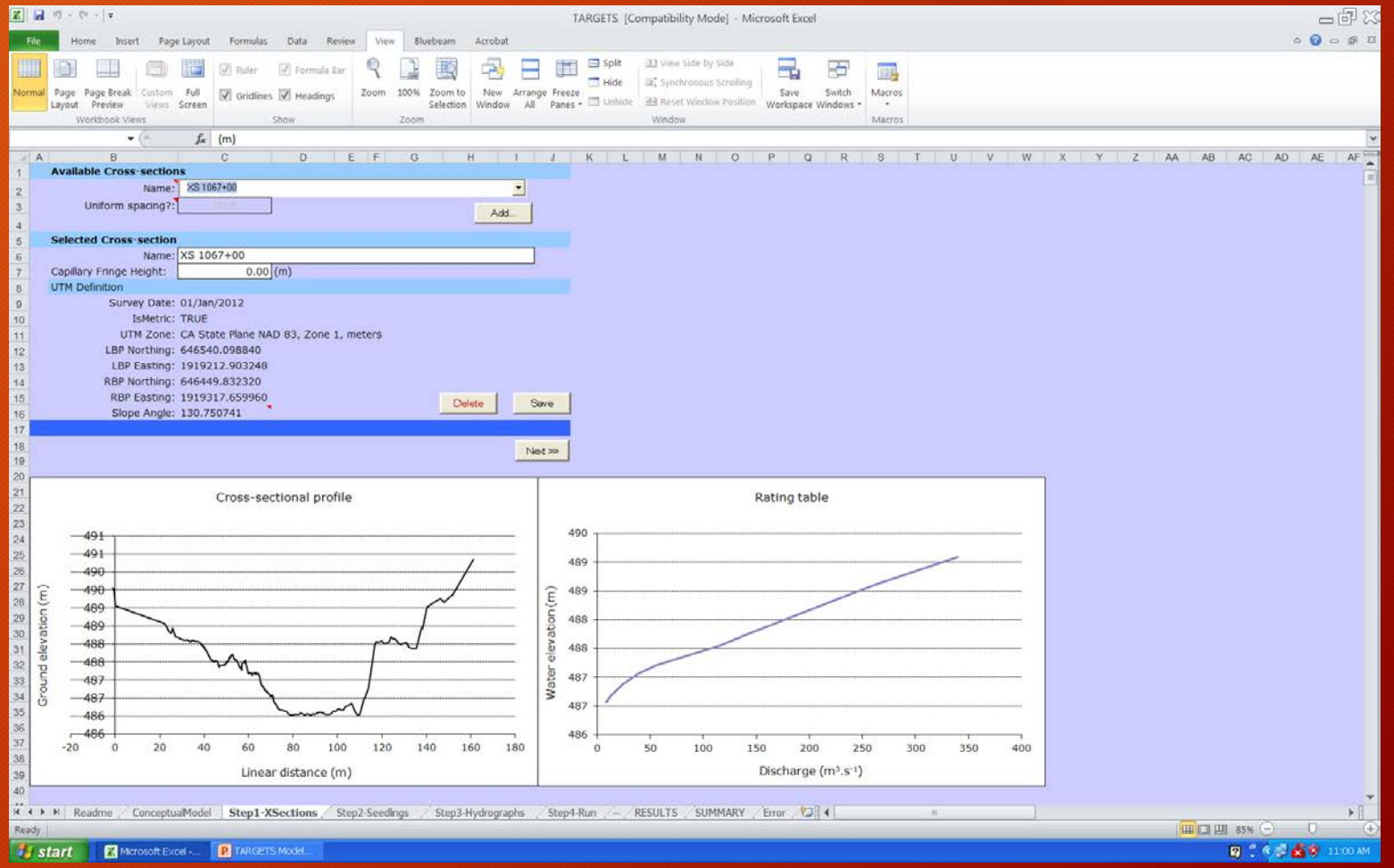
- **T**ool for **A**chieving **R**iparian **G**ermination and **E**stablishment of **T**arget **S**pecies
- Target Species are narrowleaf willow, black cottonwood, and white alder
- Currently a cross section-based approach

Black Cottonwood- TARGETS

- TARGETS uses physical, hydrologic and biologic variables to predict where target species are recruited
- The number of nodes (inflection points on the cross section) where recruitment is predicted to occur is the output.
- Where those nodes are located (inundation zone) is important also.

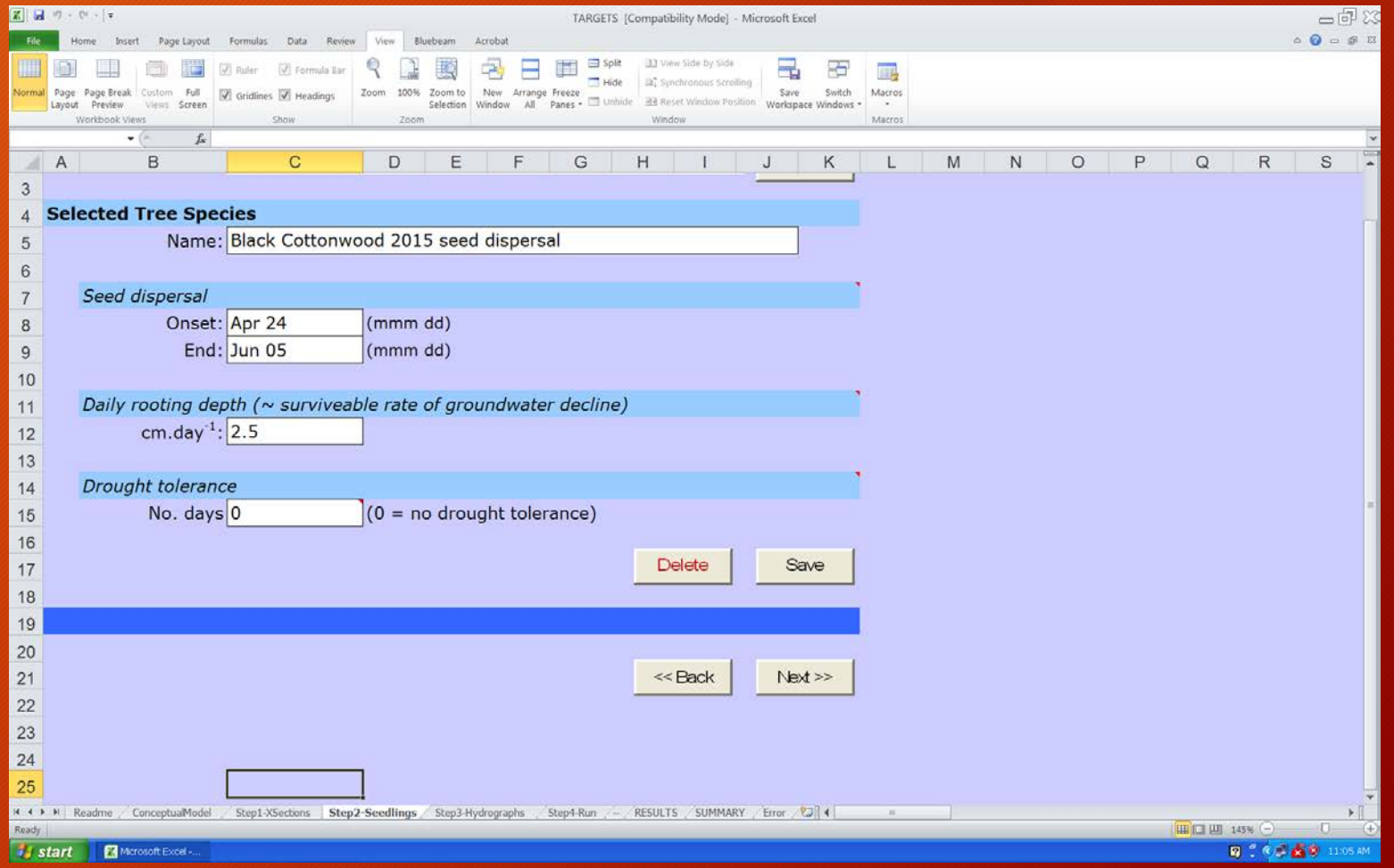
Black Cottonwood- TARGETS Inputs

- Input 1= Cross-sectional profile and Rating table



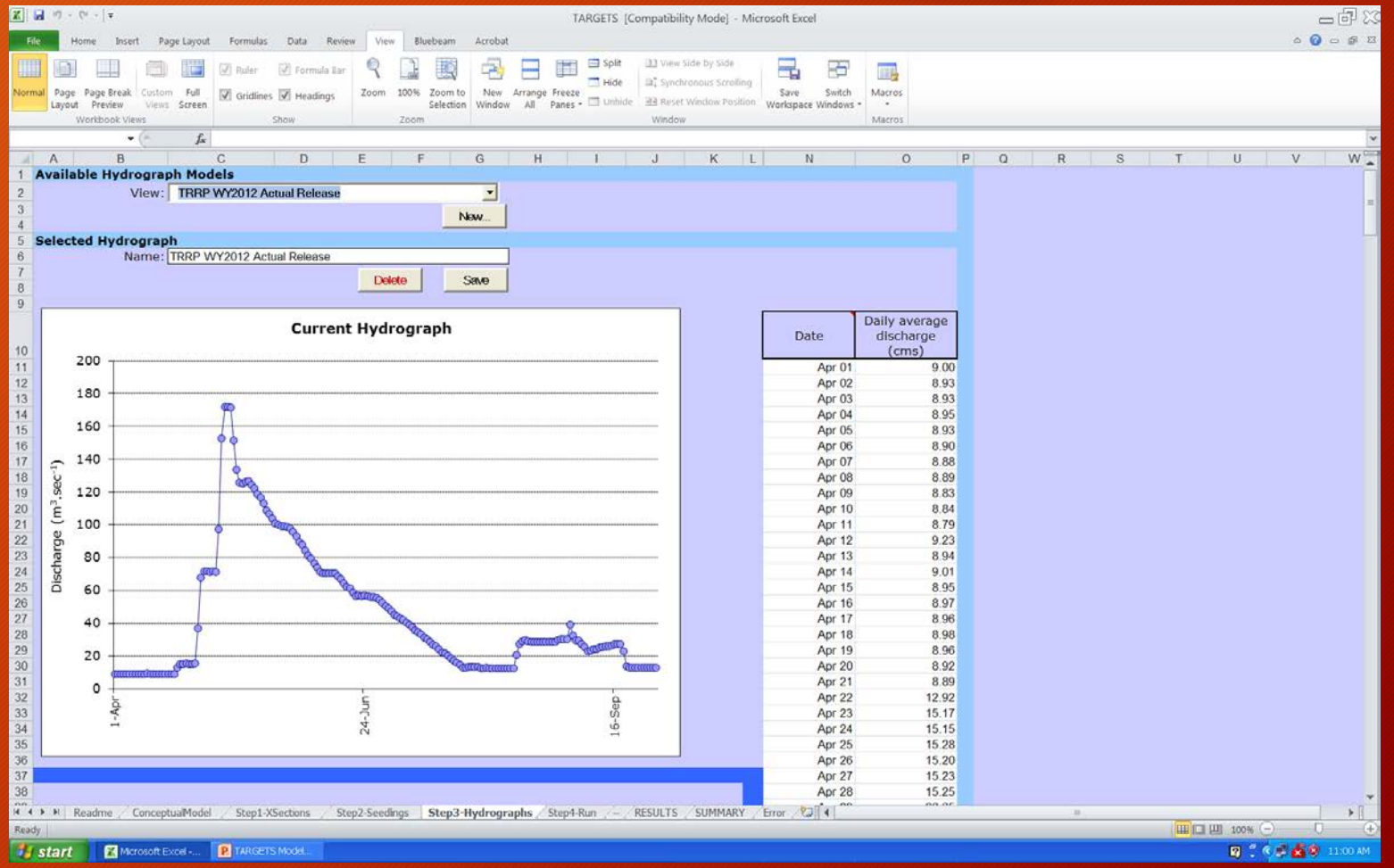
Black Cottonwood- TARGETS Inputs

- Input 2- Seedling and capillary fringe characteristics
- TARGETS can simulate a wide variety of species and substrate conditions by assigning different values to these parameters

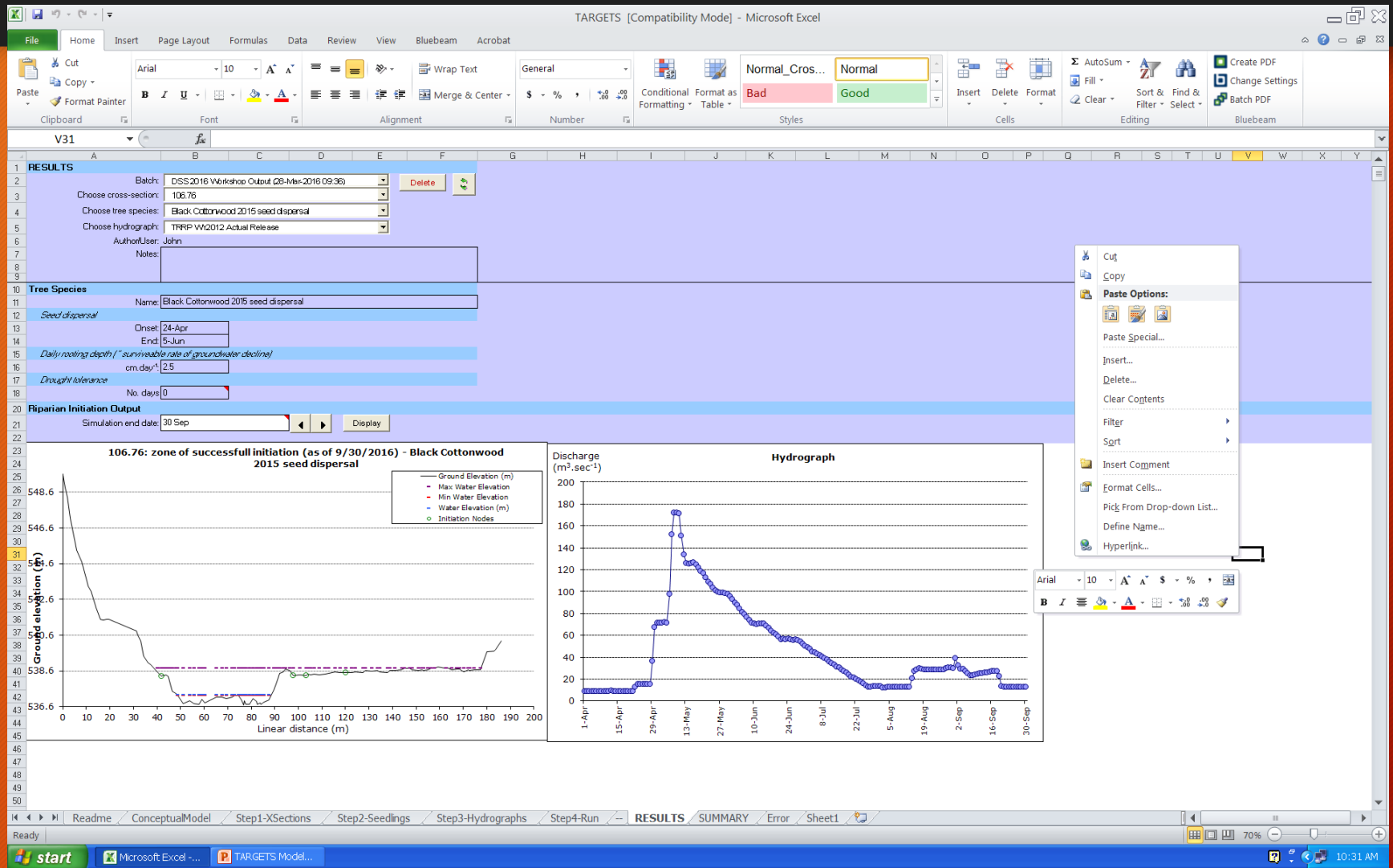


Black Cottonwood- TARGETS Inputs

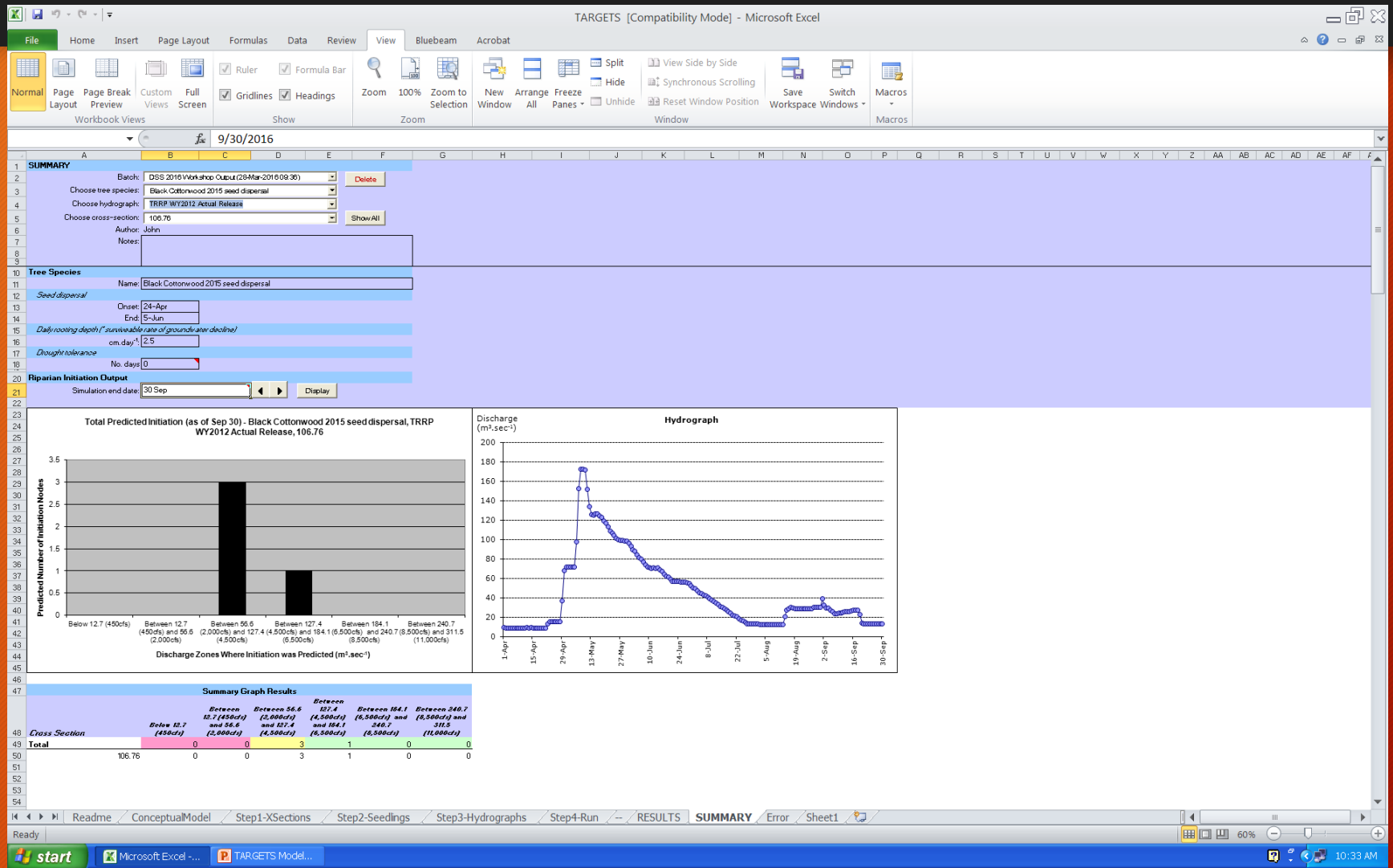
- Input 3- Hydrograph



Black Cottonwood- TARGETS output



Black Cottonwood- TARGETS output



Foothill Yellow-legged Frog

- Warming water temperatures and receding flows trigger breeding in FYF
- Egg masses are vulnerable to both dessication and scour during incubation

Foothill Yellow-legged Frog

- The FYF model evaluates stage changes at a cross section to predict whether an egg mass deposited on a specific day will dessicate before hatching

Foothill Yellow-legged Frog Model

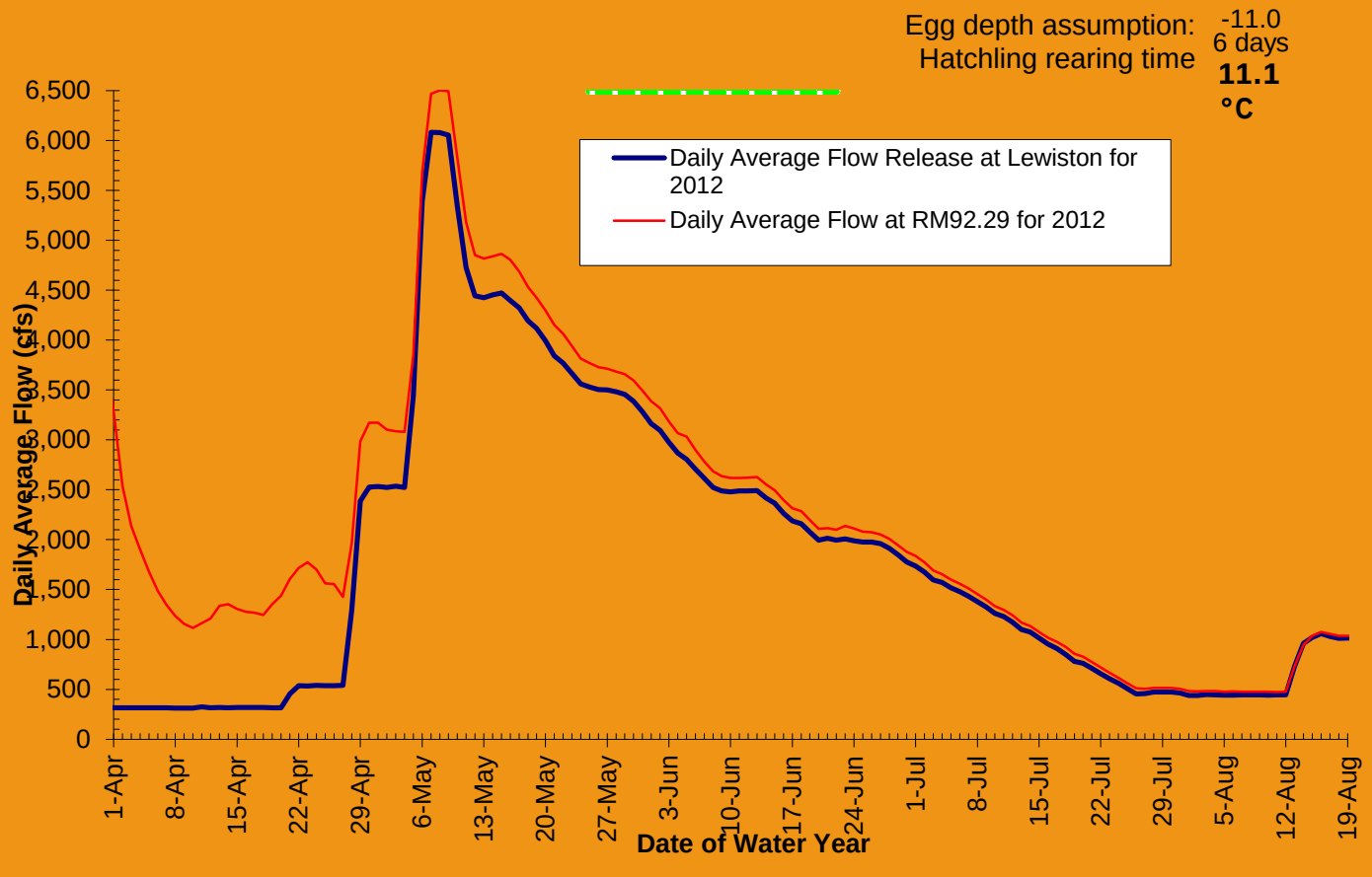
- Like TARGETS, the model is cross-section based and uses MS Excel as the platform
- Like TARGETS, the model uses a hydrograph with a stage-discharge relationship for a specified cross-section
- Unlike TARGETS, the model uses daily water temperatures with a user-defined temperature threshold to initiate the breeding period

Foothill Yellow-legged Frog Model

- Place an egg mass at a specified depth after water temperatures reach threshold temperature (t1). Compare depth of egg mass to stage predicted by rating curve each day. If tadpoles are free-swimming before stage drops below egg mass depth (t2), reproduction is successful
- Duration (t2-t1) is user-defined, and also known to be temperature dependent
- The model output is the number of days that reproduction is successful

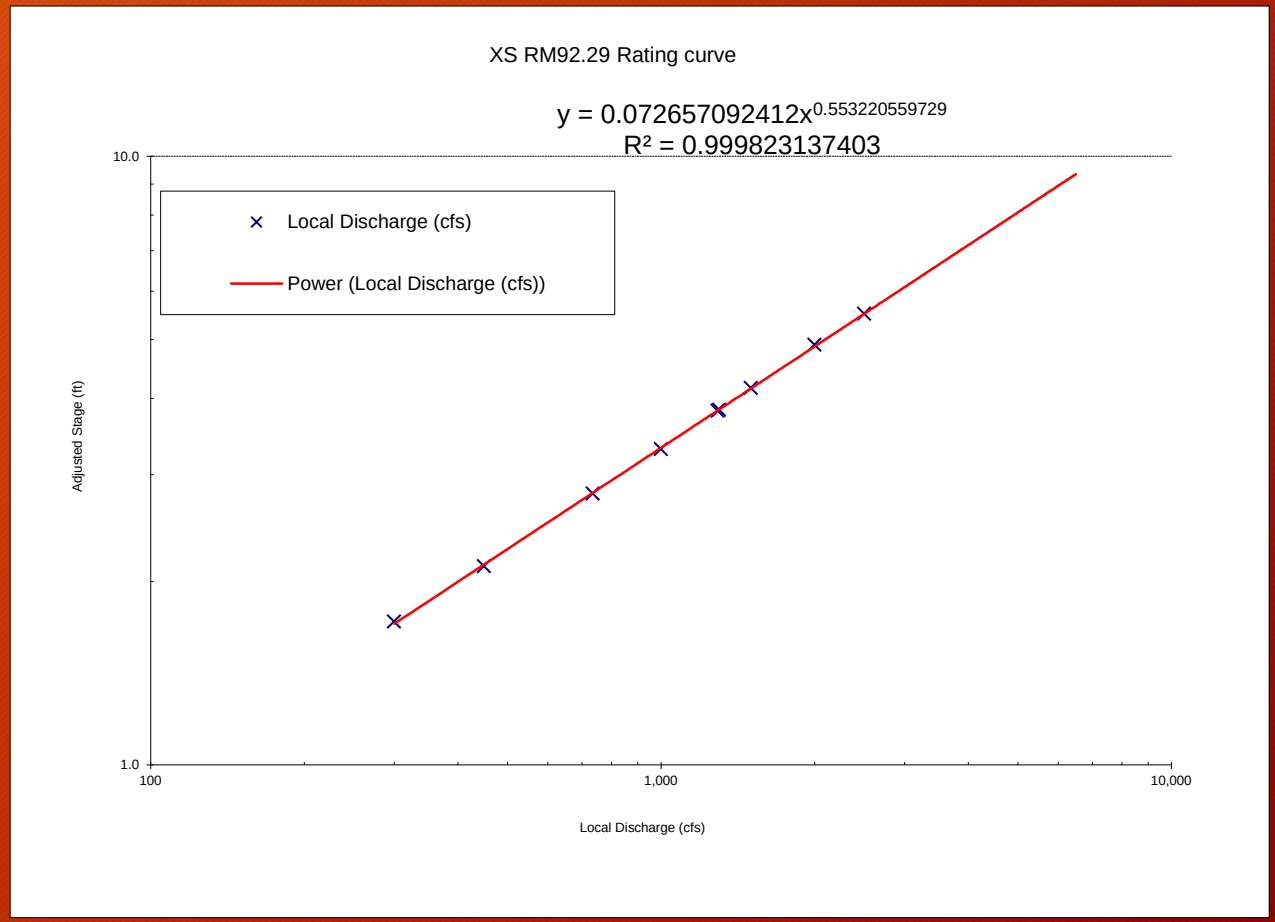
Foothill Yellow-legged Frog Model- Inputs

- Input- Assumptions
  - Egg mass depth (-11.0 cm)
  - Hatchling rearing time (6 d)
  - Temp (7 d ave of 11.1 C)



Foothill Yellow-legged Frog Model- Inputs

- Input- Cross section rating curve, hydrograph



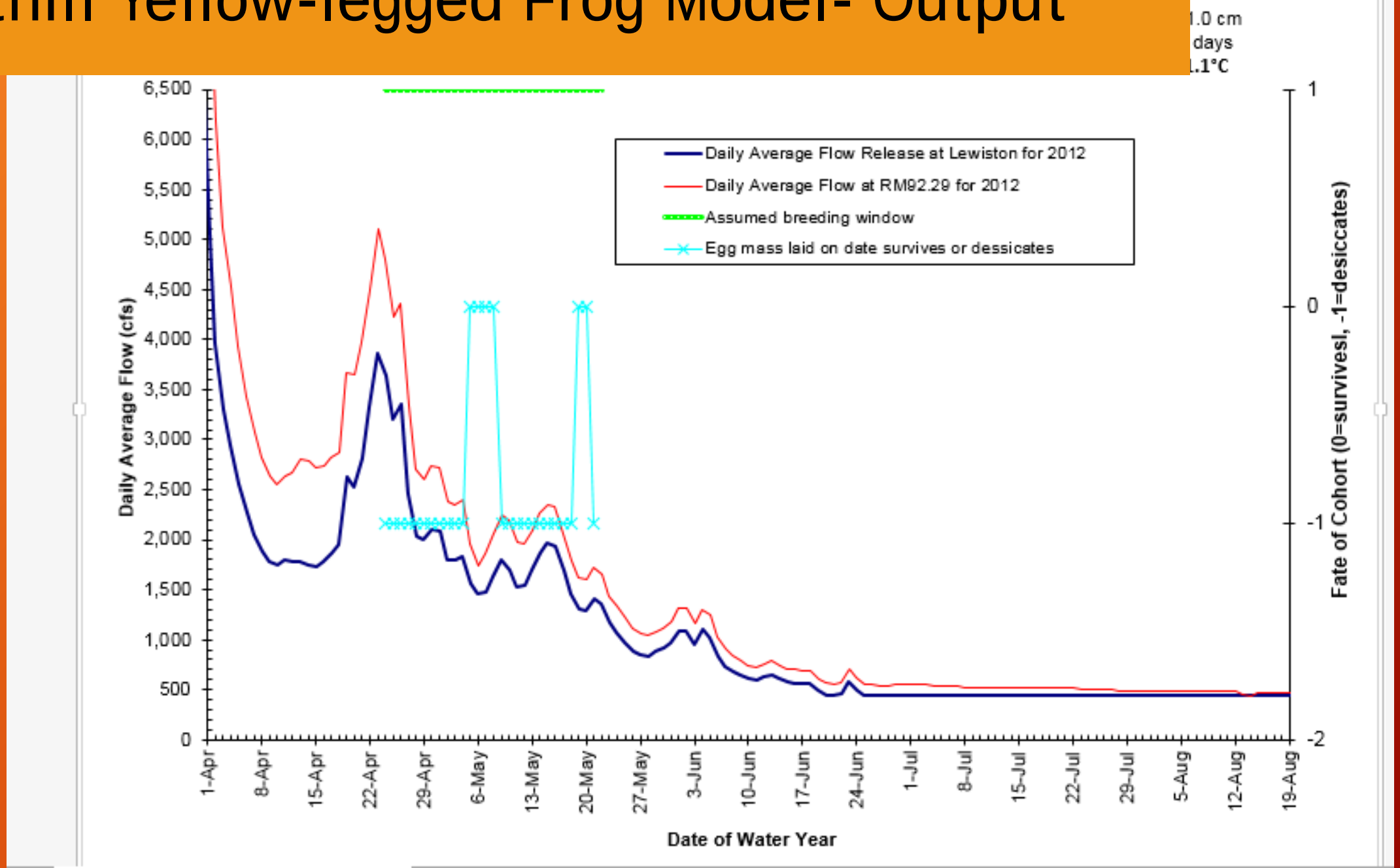
Foothill Yellow-legged Frog Model- Inputs

- Input- water temperature (model will run with any source temp data)

	Breeding					
175	N	6/19/2012	11	51.8		
176	N	6/20/2012	11.1	51.98		
177	N	6/21/2012	10.9	51.62		
178	N	6/22/2012	10.6	51.08		
179	N	6/23/2012	9.9	49.82		
180	N	6/24/2012	10	50		
181	N	6/25/2012	9.9	49.82		
182	N	6/26/2012	10.2	50.36		
183	N	6/27/2012	10.3	50.54		
184	N	6/28/2012	10.8	51.44		
185	N	6/29/2012	10.8	51.44		
186	N	6/30/2012	10.8	51.44		
187	N	7/1/2012	11	51.8		
188	N	7/2/2012	11.3	52.34		
189	N	7/3/2012	11.3	52.34		
190	N	7/4/2012	11.5	52.7		
191	Y	7/5/2012	11.5	52.7		
192	Y	7/6/2012	11.6	52.88		
193	Y	7/7/2012	11.7	53.06		
194	Y	7/8/2012	11.8	53.24		
195	Y	7/9/2012	11.7	53.06		
196	Y	7/10/2012	11.9	53.42		

... Water Temperatures EM 12 desiccation ...

Foothill Yellow-legged Frog Model- Output



Questions?

- What processes, functions, and ecosystem components should be modeled and managed?
- How do we accurately and quantitatively predict their responses to management actions?
- How do we coordinate these predictions to make management decisions?