

Applied Research Study Recommendations

	Rec. for Implementation	Program	Recommendation	Page #	Description
41	TBD	Applied Research	Fountain Darter: Conduct additional studies on movement, preferably allowing for Lagrangian tracks to be estimated.	125	Various types of mark-recapture and tracking technologies should be investigated and tested to determine movement ranges and patterns under a range of environmental (e.g. springflow) conditions. Sampling should involve different sizes of fountain darter during each of the key seasons. Understanding the movement patterns of individuals will provide information on the movement exchanges among habitat areas, range size, and provide data for model calibration and validation.
42	TBD	Applied Research	Fountain Darter: Confront the persistent lack of a relationship found between flow and fountain darter metrics...it is critical to refine the relationship at low to moderate flows and also at high flows (scour events).	125	Changing flows can have effects on growth, mortality, and reproduction that can affect multiple life stages and accumulate over time, resulting in important effects at the population level...relationships need to be delineated based on empirical evidence and, in some cases, quantified...these measures could be further supported by studies that use lab and field measurements to ensure responses are recorded over a range of flows.

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43	TBD	Applied Research	Fountain Darter: Obtain measurements related to individual fountain darter health that go beyond the densities and lengths of individuals measured in the current bio monitoring.	125	Densities have high variability and are difficult to extrapolate spatially, and lengths alone are a relatively insensitive indicator of fish responses to conditions...many bio indicators proposed that reflect the health of individual fish.
44	TBD	Applied Research	Submerged Aquatic Vegetation: Supply data on SAV growth, dispersal, and recolonization for those SAV species that are the best habitat for the fountain darter.	126	New studies that elucidate the interactions between SAV and the fountain darter would be particularly helpful.
45	TBD	Applied Research	Submerged Aquatic Vegetation: Determine if the fountain darters are using SAV for protection, to find food, and/or as a nursery area for young.	126	
46	TBD	Applied Research	Submerged Aquatic Vegetation: Determine why the fountain darters prefer bryophytes and filamentous algae, which are not vascular plants.	126	

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47	TBD	Applied Research	Texas wild-rice: Focus studies on the restoration of this plant.	126	In particular in areas that are considered suitable habitat yet are devoid of this plant.
48	TBD	Applied Research	Texas wild-rice: Focus studies on the restoration of this plant.		Planting Texas wild rice in suitable areas and monitoring for success.
49	TBD	Applied Research	Texas wild-rice: Focus studies on the restoration of this plant.		Determining whether low flow conditions are more detrimental to TWR than recreation.
50	TBD	Applied Research	Texas wild-rice: Focus studies on the restoration of this plant.		Determining the effects of restricting recreation from areas where Texas wild rice is growing under various flow rates.
51	TBD	Applied Research	Comal Springs riffle beetle: Understand the life history, life cycle and spatial distribution for better modeling of this species.		...including information on true densities of both immature and adult life stages throughout the year.
52	TBD	Applied Research	Comal Springs riffle beetle: Understand the life stages of the CSRB.		Growth rates of the life stages.

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53	TBD	Applied Research	Comal Springs riffle beetle: Understand the life stages of the CSRB.	How many generations occur each year and are they synchronous?
54	TBD	Applied Research	Comal Springs riffle beetle: Understand the life stages of the CSRB.	How fast the life cycle proceeds or how the life cycle and other life history attributes like fecundity might be affected by changing flow or sediment conditions?
55	TBD	Applied Research	Comal Springs riffle beetle: Determine the representativeness of Cotton Lure sampling	Identify how representative the currently sampling method (i.e. cotton lures) is to quantitative densities of both adult and immature stages of the CSRB.
56	TBD	Applied Research	Comal Springs riffle beetle: Understand the life stages of the CSRB.	Identify life history information important to better understanding how the populations, or portions of them, respond to changing habitat conditions related to flow or sedimentation.
57	TBD	Applied Research	Comal Springs riffle beetle: Determine its status as an indicator species.	Better assessment of how well the CSRB acts as an indicator species for the other listed species will be critical for more comprehensive management of all threatened or endangered species that are not currently being monitored.
58	TBD	Applied Research	Determine the effects from phosphorus sources, cycling, and availability on the productivity of the ecosystems.	In addition to the physical impacts of low flow, there could be very important indirect effects of low flow on the overall productivity and food web dynamics of the

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					spring/river ecosystems due to nutrients.
59	No	Applied Research	Develop a general conceptual model for the Comal and San Marcos springs ecosystem.	130:1	Project partners should be tasked with the development of a general conceptual model for the Comal and San Marcos System.