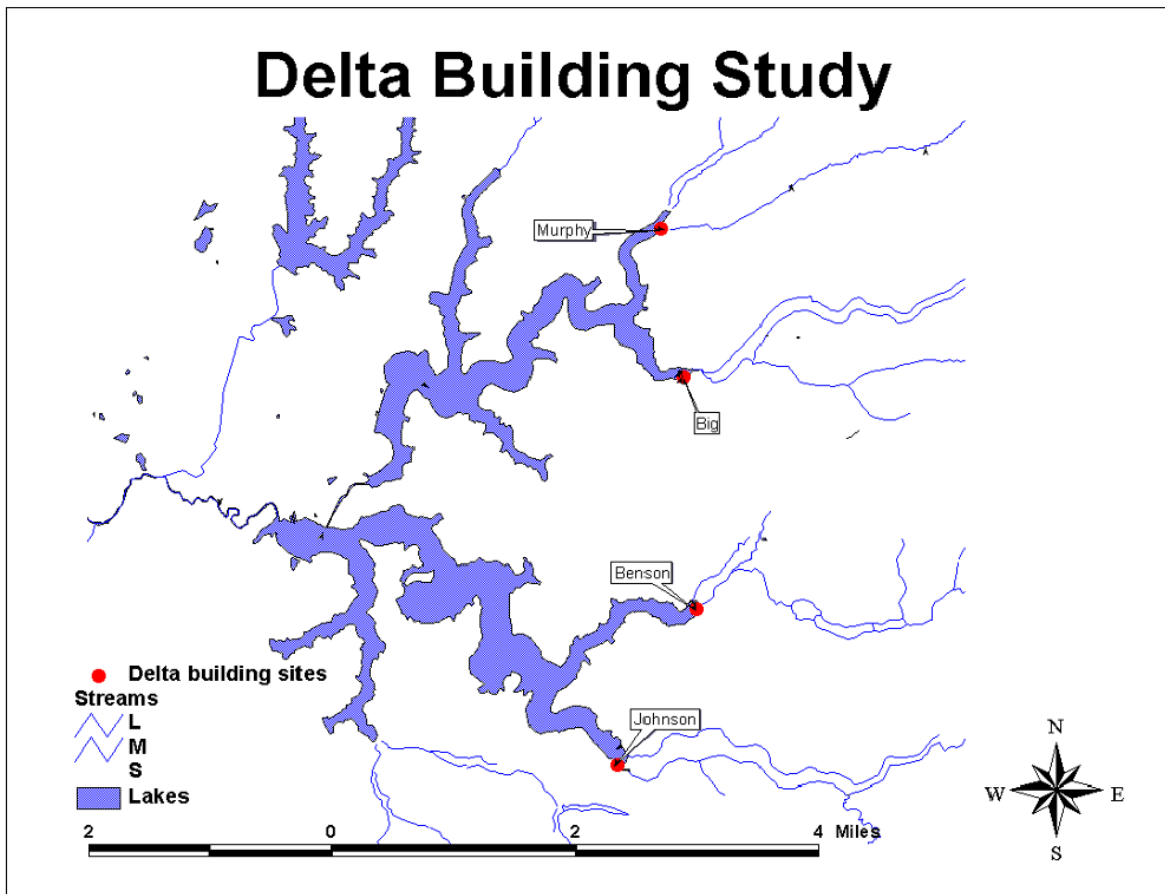


Tenmile Lakes Delta Building Study

Since the late 1940's, Tenmile Lakes has seen a sharp increase in sediment accumulation at the mouths of the tributaries that feed the lake. To monitor this sediment accumulation, Tenmile Lakes Basin Partnership (TLBP) has gone out to selected sites when lake levels are near their lowest, and surveyed the delta along transects. The delta will be measured for length, and width at the transect points. This document is a summary of the past five years surveying these sites. Sites are Benson Cr., Johnson Cr., Big Creek Arm, and Murphy Cr.



Results:

Johnson- Height of the land mass seems to fluctuate. The delta will reach a certain height, and then distribute material to other areas. What has really changed over the sampling seasons are the physical dimensions of the delta.

2004- Johnson delta was 192 ft. long by 40 ft. wide.

Instrument Height-4'

Length-191'6", length is from instrument to far tip of delta

1. 0': 6' 5.25" North, 6' 5" Center, 6' 4.75" South. Width: 26'5"
2. 40': 6' 4.75" North, 6' 3.5" Center, 6' 4.5" South. Width: 40'
3. 90': 6' 4.75" North, 6' 3.5" Center, 6' 4.5" South. Width: 19'



9-14-04 Johnson Delta

2005- Measurements taken, but lake height was almost a foot above the level needed to sample, so physical measurements are off.

Instrument Height-5'3/4"

Length-191'6"

1. 0': Center 6'9", North 6ft-6'7", South 6ft-6'7"
2. 40': Center 6' 6.5", North 6ft-6' 6 3/4", South 6ft- 6' 6 3/4"
3. 90': Center 6'10", North 6ft-6' 8 1/4", South 6ft-7'1"

Exposed land at 57'9"- Center 5' 11 3/4"

Stake height-4' 3"

2006- The delta grew to 220 ft. long by 50ft. wide.

Instrument height- 5'1/4"

Survey length- 191'6", total delta length- 219'6", width-49'5"

1. 0': Center 6'7", North 6ft-6'7.25", water's edge North-6'10.25", South 6ft- 6'7.75", water's edge South- 6'9.25", width-49'5"
2. 40': Center 6'6", North 6ft-6'5.5", water's edge North-6'10.25", South 6ft- 6'6.25", water's edge South- 6'9.75", width-38'4.5"
3. 90': Center 6'9.75", North 6ft-6'7", water's edge North-6'10.25", South 6ft- no reading, water's edge South- 6'10.75", width-21'6"



Johnson Delta 7-20-2006

2007- This site was completely blown out. The south side was under water, and survey points could not be reached. New survey marks were made using 2ft sections of rebar to mark survey points. Site where survey equipment was placed was also affected by the high flows. A new survey point had to be established. The stake is now at 5ft; old one was at 4'3". New survey point is at 4'7.5" on old post. Survey lens height at 4'10.75". New tpost height is 5'1.5". * Means new survey point. We created 3 new survey points to measure and record the changes to the delta. The original 0' is now 81'6", and continues from there. The water level was lower than previous surveys, so widths were taken at each survey transect, but height on the north side was surveyed from rebar marker that would be away from the water's edge. Survey point 4., water's edge was 8'3" away from north survey marker. Survey point 5., water's edge was 6' away from north survey marker, and original center was under 2ft of water. Survey point 5., the original center and south survey points were under water. Only the north side was exposed, and was 4'6" away from the water. New south and center survey points were established in this survey. All centers that were re-established are in the middle (half) of the width of transect. All

rebar used to mark survey points now have 4"x4" safety caps on them to prevent injury from the public walking near any exposed rebar.

Instrument Height- 4' 10.75"

Survey length- 275'4", also total delta length, width-66'

1. *0': Center-7'5", width-0
2. *30': Center- 6'6.5", North-7'4.75", South- 7'5", width-37'9"
3. *55': Center-7', North-7'5", South-7'4", width-66'
4. 81'6": Center-6'10.25", North-6'9.75", South water's edge-7'5.5", width-47'2"
5. 120'11": Center-6'6.5", North-6'11.75", South water's edge- 7'5.5", width-28'3"
6. 169'6": Center-6'10", North-7'.5", South water's edge-7'4.5", width-17'9"



Johnson Delta 7-6-07

2008- No elevations were shot this year. Adjacent landowner pulled some of the rebar, so we replaced the missing rebar and took physical measurements of the delta. Lake height was higher than last year ~6.33ft. New piece of rebar was placed at end of delta, 37 feet up from the end of last year's end point.

Survey length- 253'4", also total delta length, width-66'

1. 0': width-0 - Underwater
2. 30': width-3'9"
3. 55': width-16' - Middle rebar was pulled, South rebar was exposed by 10"
4. 81'6": width- 16'
5. 120'11": width-23'9"
6. 169'6": width-6'4"- South rebar exposed 2"



Johnson Delta 7-17-2008

2009- This year we just obtained lengths and widths and established new survey points. This site is difficult because the amount of water coming out of this creek in the winter time. The water is constantly changing the shape of this delta. This site will be surveyed more intensively in 2010.

1. 0'-14'8". 1' of land to the north, the rest is to the south.
 2. 33'-width 41', 2 new survey points established, one is 24'3", the new center, and 41', new south water's edge. We have a total of 4 survey points at this site.
 3. Width 47'1", north is 3' into the water, new center marker at 22'10", total of 4 survey points.
 4. 85'5"- This is the new centerline adjustment.
 5. 104'- 28' width, north is 5' from water's edge.
 6. 154'- 19' width. There are a total of 5 survey points at this transect, one is 8' into the water on the south side.
- Survey stake is at 4'10.5"



Johnson Delta 10-23-09

2010-Delta is 242 feet in length. Tpost/survey marker is 4'9" in length. Instrument height is 4'9" to the bottom of the lens (# taken to account for i/h variation and sediment accumulation at instrument placement).

- 1: east-8'11 3/4", center-8'4", west-8'5 1/2"
- 2: east-9'1", west-8'4 3/4"
- 3: east-7'9 1/2", center-7'11 3/4", west-8'4 3/4"
- 4: east-8' 1/2", center-7'8 1/4", west-8' 1/2"
- 5: east-7'10 1/2", center-7'6 1/4", west-8'2"
- 6: east-8'2 1/2", east*-7'8", center-7'5 1/4", west-7'11 1/4"

*old survey marker that was found.



9-14-2010 Johnson Cr. Delta

Benson- This site has been the most consistent in the accumulation of sediment. Each year it has added mass, except for 2005 when the lake was too high to get an accurate survey.

2004- The delta measured a length of 75ft. by 21ft. in width.

Instrument Height-4' 7.75"

Length- 74' 11"

1. 0': 5' 7.25" Center, Point, no width
2. 20': 5' 7.25" East, 5' 6.25" Center, 5' 7.25" West. Width: 17' 19"
3. 40': 5' 7" East, 5' 6.5" Center, 5' 8" West. Width: 10' 2"
4. 50': 4' 9.75" East, 5' 4.75" Center, 5' 7.75" West. Width: 20' 7"



Benson Delta 9-14-04

2005- Measurements taken, but lake height was almost a foot above the level needed to sample, so physical measurements are off.

Instrument Height-5' 1"

Length- 74' 11"

1. 0': Center- 6' 8", West 6ft- 6' 4 3/4", East 6ft- 6' 10 3/4"
2. 20': Center- 6' 3 3/4", West 6ft- 6' 4 3/4", East 6ft- 6' 5 1/4"
3. 40': Center- 6' 2 1/4", West 6ft- 6' 8 1/4", East 6ft- 6' 2"
4. 50': Center- 6' 1 3/4", West 6ft- 6' 4 1/2", East 6ft- 6' 1/4"

Exposed land at 17' 5"- Center 5' 3 3/4"



Benson Delta 10-7-05

2006- The delta grew to a length of 106ft. by 48ft. in width.

Instrument Height-5'1.75"

Survey Length- 74' 11", total delta length-106'1"

1. 0': Center 5'11.5", West 6ft-6'5", water's edge West-6'9.75", East 6ft- 6'75", water's edge East- 6'7.75", width-29'1.5"
2. 20': Center 6', West 6ft-5'10.5", water's edge West-6'9.75", East 6ft- 5'11.5", water's edge East- 6'7.75", width-48'3.75"
3. 40': Center 5'11.5", West 6ft-5'10.5", water's edge West-6'9.5", East 6ft- 6'.75", water's edge East- 6'7.75", width-48'3.75"
4. 50': Center 5'10.5", West 6ft-5'9.25", water's edge West-6'8.75", East 6ft- 6', water's edge East- 6'7.5", width-34'3"



Benson Delta 7-20-2006

2007- Some measurements of the new land mass. End of delta roughly 30' from first survey point, no width. 10' up from tip of delta, width-22'3". 20' up from tip of delta, width-19'9.5". 30' up from tip of delta, width-18'. 40' up from tip of delta, width-16'9.5". 50' up from tip of delta, width-25'5". The east side of survey, most points were under water because stream had changed course and had eroded some of the delta. All rebar has 4"x4" safety caps placed on top of them, and pushed down to ground level.

Instrument height-4'11.25"

Survey length- 74'11", total delta length-137' (was 141'6", but corrected 4'6" for difference in lake height.

1. 0': Center- 6'5", water's edge west-7'6.25", water's edge east-6'11.75", width-31'
2. 20': Center-6'3", water's edge west-7'8.5", water's edge east-7'6.75", width-44'9"
3. 40': Center- 6'3.25", water's edge west-7'6", water edge east-7'4.75", width-37'8"
4. 50': Center-no rebar marker, no survey point., water's edge west-7'4", water's edge east-7'5", width-32'



Benson Delta 7-6-2007

2008- This year, the land mass really expanded into the lake. New survey points were established. Format has changed for survey data. We are now counting up from the survey marker, working towards the tip of the delta. A lot of sediment came in and covered the existing survey marks. Survey marks were dug up to show the amount sediment accumulation. This is shown in the data as cap and ground. Cap is measured from the top of the survey mark, which was buried, ground in at the top of the sediment that covered the survey mark.

We are now counting up from the survey marker, working towards the tip of the delta. So 0' is #4, 50' mark is #1.

Instrument height-4'10", Stake height-2'4.5", width at stake is 28'4"

Survey length- 172'2", total delta length-172'2"

1: Center- 5'11.5", water's edge west-7'4.25", water's edge east-7'7.25" (east survey point was 4'6" into the creek), width-29"

2: Center-6'5" (Cap), 5'11" (ground), water's edge west-7'6.25", water's edge east-7'4.25" (survey point was 5'9" into creek), width-32'11"

3: Center- 6'6" (cap), 5'10.75" (ground), water's edge west-8'1.75" (survey point was 3'1" into lake), water edge east-6'11.5" (12'10" into creek), width-32'2"

4: Center-6'7.25"(cap), 5'10.75"(ground), water's edge west-7'6"(cap), 7'1.5"(ground)(in lake 1'1"), water's edge east-6'11.75"(12'10" into creek), width-24'5"

to creek edge, 45'2" to other side of creek, 57'1" to land edge ** other side of creek and land edge did not get survey marks.

5: Center-6'5.25", water's edge west-6'11.25", creek side west-6'9.5", creek side east-6'7.75" waters edge east-6'9.75", width-32' to creek edge, 39'5" to other side of creek, 57'2" to land edge

6: Center-6'3.25", water's edge west-6'11", creek side west-6'11", creek side east-6'11" waters edge east-6'10.5", width-40'4" to creek edge, 47' to other side of creek, 63'10" to land edge

7: Center- 6'2", water's edge west-6'11", water's edge east-6'10.5" (this also creek side west. Due to lake intrusion, there is no exposed land on other side of creek. This will probably change next year), width-59'4"

8: Center- 6'.24", water's edge west-6'10.5", water's edge east-6'10.5" (this also creek side west. Due to lake intrusion, there is no exposed land on other side of creek. This will probably change next year), width-39'7"

9: Center- 6'10.75", width-0



Benson Delta 7-17-2008

2009- This year we have implemented a procedure in which we measure the sediment accumulation on top of the survey caps. The delta seems to be gaining mass on top, and our survey post has been removed, so knowing sediment accumulation on top of the delta for surveying would not be known. We feel that the 4"x4" safety cap on top of the rebar will keep the rebar from migrating down in the sediment.

Survey length- 172'2", total delta length-172'2"

- 1: 38'7" width to water's edge, west marker is 39'7" and 1' in the water. New east marker. Center marker is 147' on centerline, and 19'8" on width tape. Depth of sediment on center marker is 3", west is on sediment surface, but is 4" under water.
- 2: width is 43'4" to water's edge, 44'3" to west survey mark which is underwater. Center mark is 137'1" on centerline tape, 19'9" on width tape. East is a new survey mark. Depth of sediment on center marker is 9", west marker is 6" under water, but on top of the sediment.
- 3: width – 39', west survey mark is 41'10" (in the water ~2ft), again new east mark established. Center marker is 117'3" on centerline tape, 14'3" on width tape. Depth of sediment on center marker is 1' 3/4", west is on sediment surface, but 7" under water.
- 4: width is 30'6" west marker is 1" in water. Center marker is at 97'5" on centerline tape and 14'3" on width tape. Depth of sediment on center marker is 1' 1.5", west has 6" of sediment and 1" of water. New east marker was established.
- 5: width- 32'1". Center marker is at 82'6" on centerline tape, 15' on width tape. Depth of sediment on center marker is 7", west is level, new east mark established, and is level to sediment.
- 6: width is 63'9" New east and west survey markers. Center marker is a 62'6" on centerline tape, and 49'2" on width tape. Depth of sediment is 4 3/4" on center marker, east and west are level.
- 7: width is 78'2", creek cuts through at 19'3" to 42'. New east marker, no markers along creek bank (tired of losing them) Center marker is 42'7" on centerline tape. Depth of sediment is 4" on center marker, 4" on west marker. East is level.
- 8: Width is 55'7", new survey marker on east side (creek side), west survey marker is at 53'7". Center marker is 37'8" on centerline tape, 22'7" on width tape. Depth of sediment is 7" on center marker, 5.5" on west marker. East is level because it is new.
- 9: Width is 24'9". Depth of sediment is 2.5" on center marker.



Benson Delta 8-11-2009

2010- Some markers were under a lot of sediment, and in the water table. These could not be reached, so measurement were taken as deep as possible, and estimated from there. Benson Creek is constantly changing its course through the delta to the lake. This has made it difficult to obtain accurate measurements of the east side.

Survey length- 172'2", total delta length-171'2"

1: Width-30'. West side 2" of water, 6" of sediment and the marker is 7" into the water. Creek has blown out 7' into the delta. East has 1'1" of sediment and 3" of water on top of it. There is 1'2" of sediment on top of center marker.

2: Width-31'10". Creek has shifted. West side is 1'1" in water, east marker in creek with at least 2' of sediment on top of it. There is 1'6" of sediment on top of center marker.

3: Width-48'. West side is 3' into the water. East survey marker is 3' from creeks edge. ~ 3 ft of sediment on east survey marker.

4: Width- not taken. West side is 1'8" into the water and under 2' of water and another 8" of sediment. East side is 1'8" away from the creek and 8" of sediment covering the marker. Center marker is covered by 1'8" of sediment.

5: Width- 30'6". West side is covered by 7" of sediment and at the water's edge. East survey marker is lost in the creek. Center marker is covered by 1'8" of sediment.

6: Width- 28'3". West side is 1' into the water and covered by 6" of sediment. East marker is gone. A new one has been placed at water's edge. 11" of sediment on center marker.

7: Width- 37'4". West marker 1'10" into the water and covered with 6" of sediment. No east marker (we keep losing them). Center marker has 10" of sediment covering it.

8: Width 42'. West side is 6" into the water with no sediment accumulation on it. East side is 12' into the creek and has ~ 1' of sediment covering it. Center marker has 10" of sediment covering it.

9: No width was set at delta tip. Marker is 1' away from shoreline in the water, and has 11" of sediment on top of it and ~ an inch of water



Benson Delta 9-3-2010

Sunlake- This site was promising, but it was too accessible to the public, and was compromised. In 2005, instrument marker was removed, making replication of the 2004 survey impossible. In addition, site was bulldozed by the upland landowner to create a beach.

2004-

Instrument Height- 4' 10.25"

Length- 38' 1"

0': 7' 7.5" Center, Point, no width

5': 7' 7" East, 7' 6.5" Center, 7' 8" West. Width: 23' 4"

15': 7' 7.25" East, 5' 4"-9ft in, 5' 1.25"-4ft 6inches east of center, 7' 7" Center, 6' 7"-4ft 6inches west of center, 6' 10.25"-9ft from west water edge, 7' 7.75" West. Width: 40' 3"



Sunlake Delta 9-14-04

2005- Instrument marker was removed, compromising site.

2006- Water level too high for a survey.

2007- Site bulldozed by landowner to make a beach. Site destroyed, will relocate site to Big Creek.



Sunlake 7-20-2007

Big- A site on Big was added in 2007 because of the loss of the Sunlake site.
2007-

Instrument Height-5'

Length-420'

1. 0': 6'3.5" center. No width
2. 50': 6'3.5" left, 5'10.5" Center, 6'4" right, Width: 49'6"
3. 100': 6'3.75" left, 5'11" Center, 6'2.5" right, Width: 105'
4. 150': 6'4.75" left, 5'7.5" Center, 6'3.25" right, Width: 135'4"
5. 200': 6'1.75" left, 5' 10" Center, 6'3.25" right, Width: 118'7"
6. 250': 6' left, 5'8.5" Center, 6'4.75" right, Width: 109'6"
7. 300': 5'11.75" left, 5'11.5" Center, 6'.5" right, Width: 70'2"
8. 350': 5'10.25" left, 5'.75" Center, 5'11.25" right, Width: 59'6"
9. 387': 5'9.25" left, 5'4.5" Center, 5'1.75" right, Width: 33'
10. 420': 5'9" Center. No width

All rebar was capped with 4"x4" safety caps.



Big Delta 7-27-2007

2008- Total survey length is 318'.

1. 0': Underwater
2. 50': Underwater
3. 100': Underwater
4. 150': Left underwater, water's edge on left at 104', center exposed, just right of center 61'5" water's edge. Water intrusion for 10' to 51'5", right underwater, but exposed, water's edge at 2'.
5. 200': left underwater, really deep, water's edge at 104', center intrusion at 72', water's edge on right 59'6" at center mark, right water's edge at 1'10", right marker underwater.
6. 250': Left underwater, left water's edge at 97', center is dry. Right water's edge is at 2', right underwater.
7. 300': Exposed area 64'4", left underwater, the rest are exposed, right is on water's edge.
8. 350': All dry, 10" sediment on left marker, 10" sediment on center marker, _" sediment on right marker. Width is 71'7"
9. 387': Left could not be found, 11" sediment on top of center marker, 6" of sediment on top of right marker. Width-64'6"
10. 420': 9" of sediment on top of marker. Width is 40'.

Delta extends another 48' above last point.

2009- Total survey length is 390'.

1. Under water
2. Under water
3. Waters edge at 197' down reel tape, no sediment on center survey marker, the other 2 markers could not be found due to water
4. 192' down the reel tape. No creek side survey point, 0" sediment on bank side, 2" of sediment on center point. Width is 113'.
5. New transect. 122' down reel tape, no side survey marks, just a center marker. Width is 92'.
6. 82' down the tape from survey point, new center point has been established. No sediment on bank side, no survey point on creek side. Width is 92'.
7. 14'4" down the tape from survey point. No sediment accumulation on center or bank side marker. No survey point along creek. Width from creek to bank is 62'8".
8. 14'4" up the tape, 9" of depth on center marker, 1'6" of sediment on top of survey marker along creek, no sediment on bank side marker. Width is 61'8" from bank to creek.
9. 50'8" up on tape. 1'1" of sediment on top of point at center. 7" of sediment on survey point next to slope, no survey point along the creek.
10. 84 feet from survey equipment upstream. 1 foot of sediment on top of survey marker, width is 76' from creek to beginning of slope.

Delta cuts far left, leaving the last 2 survey points under water. It is 44' to the south of the original centerline. 237' down the reel tape.



**Big Cr. Delta looking upstream and downstream from location of survey equipment
8-27-09**

2010- Willows have really taken over this site. This has made surveying and doing sediment accumulation on survey markers almost impossible. Instead, we were only able to get lengths at 6 survey sites and total delta length. This site seems to be turning into a wetland.

Total length of delta is 305'9"

1. Under water
2. Under water
3. Underwater
4. Underwater
5. Width-29'
6. Width-37'
7. Width-56'7"
8. Width-57'
9. Width-68'2"
10. Width-23'5"



Murphy- This site has never shown sediment accumulation at the creek mouth. The one year we has a landmass to survey, the lake level was a foot below when we survey, and the sediment type was different than other sites.

2004- No delta was visible.



Murphy 9-14-2004

2005- No delta was visible.

2006- Delta was observed, but the potential site to place the survey instrument and marker was on private land, and permission to access this spot could not be obtained.



Murphy Delta 7-20-2006

2007- Delta was observed and landowner granted us permission to survey. Though there was a landmass present, the type of soil was very loose and organic, which would be associated with wetlands.

Instrument Height- 4' 8.75"

Length-63' 2"

1. 0': 7' 4" Center, no width
2. 10': 7' 1.75" Center, width- 4' 10"
3. 20': 7' 2.75" left, 7' .75" center, 7' 5.75" right, Width: 9'
4. 26': 7' 5" left, 6' 8.25" center, 7' 5" right, Width: 14' 6"
5. 40': 7' 3.25" left, 6' 9.75" center, right marker was placed, but no measurement, Width: 17' 5"



Murphy Delta 7-20-2007

2008- No delta observed
2009- No delta observed
2010- No delta observed



September 2010. Mouth of Murphy Creek at 6.43 lake level. No sign of sediment accumulation or delta building.

Conclusion

Over the length of this project, the creek mouths have shown that this is a very dynamic environment. Benson Creek has been the steadiest in delta building. It has either increased in size, or in sediment accumulation every year. Murphy Creek has not changed since we first tried to monitor it in 2004. The wetland it contains has done an effective job in reducing sediment input into the lake. Johnson Creek has changed every year, just not in the way we assumed it would. Though there is a large amount of sediment input from this system, Johnson Creek flow is so great in the winter that it is spreading the sediment further out into the arm of the lake. The velocity of this creek is also so great that it is constantly changing the physical dimensions of the delta. It might be better to do depth reading further out in the lake, though aquatic macrophytes might interfere with this type of sampling. Big Creek was first surveyed at extremely low lake levels, so the delta was smaller in subsequent years. The increase in sediment deposited on the survey markers was dramatic, and in 2010, the willow growth exceeded 10 ft. in some spots. This site seems to be creating a new wetland.

Date	Site	total delta length	length change from original survey (ft)	Max Width (ft)	Width change from original survey (ft)	Average Elevation Increase (ft)	Lake Height	Comments
2004	Johnson	191.5	0	40	0	0	6.43	
	Benson	74.92	0	20.6	0	0	6.43	
	Murphy Cr.	0	0	0	0	0	6.43	No exposed landmass
	Sunlake	38.03	0	40.3	0	0	6.43	
2005	Johnson	57.75	-133.75 *	NA*	NA*	NA *	7.3	* Lake higher than previous year survey
	Benson	17.42	-57.5 *	NA*	NA*	NA *	7.3	* Lake higher than previous year survey
	Murphy	0	0	0	0	0	7.3	
	Sunlake	NA	NA	NA	NA	NA	7.3	Survey stake was pulled and site was leveled with a tractor to create a beach Looking for a new site at the mouth on Big Cr.
2006	Johnson	219.5	28 *	49.4	9.42	NA	6.43	* length changes are based on 2004 survey
	Benson	106.1	31.16 *	48.3	27.7	0.08	6.43	* length changes are based on 2004 survey
	Murphy	0	0	0	0	0	6.43	no exposed land mass
2007	Johnson	275.3	83.83	66	26	NA *	5.9	Johnson creek cut a new channel through delta, new survey markers established. No correction for lake level difference in this data. Lake elevation is lower, which explains landmass increase
	Benson	137	62.08	44.8	24.2	0.5	6.03	Lower lake elevation would explain increased land mass size compensation in lake level differences were not done in this data.
	Murphy	63.17	63.17	17.4	17.4	0	5.74	Lake is lower this year, so some land has been exposed.
	Big	363.8	0	57.5	0	0	5.74	Newly established site, considered original survey for width and length changes surveyed at lower lake level, will try to survey at 6.43 ft next year
2008	Johnson	253.3	61.83	66	26	NA *	6.33	* upland landowner pulled some exposed rebar survey markers, No correction for lake level difference in this data. new survey marks established
	Benson	172.2	97.25	63.8	43.3	0.67	6.31	Slight difference in lake level from the 6.43 ft. .13 ft has been compensated for in the data.
	Murphy	0	0	0	0	0	6.33	No landmass at regular survey height
	Big	310.5	-53.33	49.8	418	0.67	5.79	Creek cut new path in delta, and has built up material ** Slight difference in lake height might account for dimensions change
2009	Johnson	268.7	71.83	47.1	7.01	NA *	6.03	rebar has been pulled again, new center point to make the measurement conform to the delta shape. No correction for lake level difference in this data. new survey marks established
	Benson	172.2	97.25	63.8	21.4	0.67	6.31	Slight difference in lake level from the 6.43 ft. .13 ft has been compensated for in the data.
	Murphy	0	0	0	0	0	6.33	No landmass at regular survey height
	Big	310.5	-53.33	49.8	-7.8	0.67	5.79	Creek cut new path in delta, and has built up material ** Slight difference in lake height might account for dimensions change
2010	Johnson	242	50	unknown	NA	NA *	6.23	Surveying done. Length, but no widths were taken. Site continues to change. Observers can see the lake surrounding the site getting shallower. new survey marks established
	Benson	171	9.25	42	43.3	0.95	6.4	Benson Creek has cut a new path through the delta, altering the physical dimensions.
	Murphy	0	0	0	0	0	6.35	No landmass at regular survey height
	Big	310.5	-53.33	49.8	-7.8	0.67	6.35	Willow growth is out of control. Site is almost impossible to survey with this type of vegetation growth. Just length and widths were taken

