

Aerial Photo Interpretation

Summary of Results

The evaluation revealed a highly modified stream network with many areas of responsive channel boundaries. The severity of the channelization induces correspondingly severe incision. Even without stereo-paired photos that allow estimation of channel depth, there is abundant evidence of incision. Moreover, channel banks are poorly vegetated and dissection of even small gullies is common indicating that the banks are weak and not well equipped to resist failure in the event of continuing incision. The weakness of the channel boundaries combined with the severity of the channel manipulation suggests that incision may indeed present an ongoing problem. This is apparent in the main stem and in several of the major tributaries. North of Raymond Road the in-channel bars present features consistent with geotechnical failure. This is a common occurrence where incision has caused stream banks to exceed their critical height and become susceptible to failure. Other reaches of the stream appear to be in later stages of evolution such as channel widening or appear to be adjusting their meander pattern. Extensive depositional features are rare. Although the stream appears to be generating considerable sediment based on the extent and severity of gullies and bank failures, the absence of significant shelves, center bars and similar features suggests that the sediment remains in suspension through the reaches of the stream examined here.

Methods

The interpretation was conducted in general compliance with the methods outlined in *Aerial Photo Interpretation* (Lueder, 1955). The aerial photos and soils map in GIS format were supplied by the City of Lincoln and the Lower South Platte Natural Resource District. This appendix is an interpretation of the surface soils, landforms and drainage features and is limited to the information directly retrievable from the GIS layers provided. Other information which influences landform or drainage features such as historical precipitation patterns was not provided and is not reflected in this report. The photos are a 2005 color photo-mosaic and individual, black and white panels from 1949 and 1955. All photos were taken in the leaf-on period with the 1949 and 1955 photos from July. Customarily in aerial photo interpretation, the earliest photo depicts the landforms in their least altered condition and subsequent photos are referenced to this baseline. However, because only the 2005 photo provides complete coverage of the basin and is of higher quality than the older photos, this is the baseline image to which the others are compared. Figure E-1 depicts the Little Salt Creek Basin with major roads and tributary designations.

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Overview

The features of the Little Salt Creek basin are consistent with Aeolian (wind deposited) land forms. The topography is gently undulating with generally uniform slopes and orientation roughly aligned with prevailing winds. The dense drainage network is also a characteristic of wind-deposited silt landforms as are near-vertical stream banks, steep head ends of gullies and other erosion features. This drainage network is dendritic meaning that it has an extensively branched or tree-like pattern. Classical Aeolian land forms are uniform and integrated. Here Little Salt Creek differs from the classical in having extensive seeps, marshes and other features that appear to lack a direct surface water connection to the stream. These discontinuities may be indicative of dispersive soils. The distinctive features noted above also differentiate this basin from others in the Lincoln area. Bright white features on the banks or over banks are common in this basin. The appearance of these features is consistent with evaporites (evaporated salt areas) but positive identification is not possible based only on the photographs so they will be described in this appendix simply as white features.

Throughout much of the basin, the woody riparian vegetation is exceedingly sparse; trees rarely occur on the streambanks and the vegetation appears to be herbaceous or possibly low-growing shrubs.

This stream form has been dramatically altered for more than 50 years. The earliest photos from 1949 depict considerable channel realignment. Coverage for the lowest reach of the stream were not available for 1949 but the 1955 photos show a radical channelization that reduced the channel length by about 70% from just north of Arbor Road to the confluence.

Scrolls, oxbows and other evidence of channel movement over time are abundant. While most of the changes in channel alignment are clearly man-made, some of the extensive migration across the broad, shallow valley may be natural.

The main channel appears to be flanked by depressions and slumps, some near the bank, others as far as 800 feet away. Surrounding soils are blotchy and mottled sometimes with white streaks or patches.

Drainage network

Evaluation of the surface drainage patterns provides insight into fundamental material characteristics affecting infiltration, stream response to manipulation and potential land uses.

Density – the network is dense to very dense throughout the basin. A high density of surface drainage ways generally indicates comparatively erodible soils
Orientation – the stream has an orientation from north-north west to south-southeast
Integration – the network has moderate integration, an assessment that excludes farm ponds as indicators of unintegrated networks. In a highly integrated network, a point on anywhere in the surface drainage ways could be connected with an unbroken line to any other point in the drainage way. Sinkholes, marshes and abandoned oxbows are examples

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of drainage features that lower the degree of integration. There are several marshes north and south of Raymond Road and east of NW 12th Street. In addition, the reach between Arbor Road and Bluff Road is highly discontinuous.

Uniformity – The marshes seem to occur at greater density in the southern reaches. The uniformity is moderate. Non-uniform watersheds may require different management methods for different parts of the basin.

Angularity – comments of angularity reflect assessment of those reaches which appear to be only nominally man-aligned. That said, the network has low angularity, with most tributaries joining the main channel at an angle slightly below 90 degrees indicating an absence of underlying geologic control.

Degree of control – There is very low degree of control by the underlying geology.

Channel Observations - 2005 Aerial Photo (color) Main Channel

General notes: Land use is agricultural with some residences. The most dense residential development is south of I-80 though new developments have moved north. While there are some tilled fields close to the stream, the land adjacent to much of the main channel is marsh, particularly in the southern reaches. The GIS track deviates substantially from the channel in this photograph sometimes by over 100 feet.

The observations begin at the I-80 access road and proceed upstream roughly paralleling N 27th Street. The main channel is approximately 96,000 feet from the confluence with Salt Creek to the crossing at Ashland Road.

The channel is deeply incised with steep banks. Indications of previous channel locations are common as are in-channel sediment deposits. The heads of gullies are steep even by the standards of Eastern Nebraska. Even small tributaries and gullies are dissected. The woody riparian corridor is poor to non-existent. Sinkholes, marshes and white features flank the stream particularly near TRIB 15. The lower two thirds of the stream between Bluff Road and I-80 appears channelized and has a reach sinuosity of 60-70% lower than the historical alignment based on the 1955 photo comparison. Extensive marshes, depressions and white features occur near Bluff Road. The white features are usually linear and appear at top of bank along both the main channel and minor gullies. Moving upstream into the meandering reach deep shadows indicate the banks may be undercut. The banks are ragged with some channel bars. There is very little vegetation even in the non-farmed areas. Small gullies are deeply incised and dissected. White features occur along minor drainage features or at top of bank. North of Arbor Road and west of N 27th Street, the TRIB 20 outfall seems to be failing and is the site of considerable dumped debris. There may be incipient flanking of the southern wingwall on the N 27th Street culvert on the east side of this tributary. Approximately 1360 feet north of Arbor Road, a pipe outfall draining a field has caused a sinkhole on the right descending bank.

There is an especially extensive area of white features and a possible salt plume in the channel north of Bluff Road. Approaching Waverly Road bank retreat becomes more pronounced and a very tight meander is nearly encroaching on a cultivated field. Gullies appear to initiate in the marshy areas and approach the main channel. The area around the tight meander south of Waverly Road has the appearance of dispersive soils; erosion

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features with the appearance of layers of weathered rock and gullies that have piped to the stream. Moving north from Waverly Road, the dispersive areas seem more pronounced. Deep, “crow’s foot” gullies flank the tributaries along this reach. Bank retreat appears to be more pronounced along the right descending bank.

About 1800 feet north of Waverly Road there is a large, dendritic white feature on both banks. The toes of both banks have a blocky, crenellated shape similar to castle top battlements. The gullies appear in some cases to be deeper at the gully head or mid area as opposed to the confluence with the creek. Areas of white features are 70 to 100 feet from top of bank. The over bank is populated with a dense, fine web of drainage features that lack a clear connection to the stream. The orientation of this web roughly parallels the northwest to southeast orientation of the main channel. The weathered bedrock appearance of the stream banks that may be indicative of dispersive soils continues through the N14th Street crossing. However, the stark, white features decrease approaching N14th Street.

Northwest of N 14th Street, the aerial photo coverage is of lower resolution. Starting about 200 feet north of the bridge at N 14th Street, there appears to be a near-continuous bank failure of the left descending bank that extends over 500 feet. The mottling and blotched appearance of the over bank is especially notable on the left descending bank where there has been less agricultural disturbance. Alternate channels abound through this reach and the stream takes on almost a braided appearance. Some of the alternate channels may be active; however, the stream is unlikely to be truly braided because the bed slope is too low and the channel lacks the abundance of permanent in-channel bars that define a true braided stream. Abandoned oxbows, sinks, marshy areas and scrolls characterize this channel. There is a linear series of sinks paralleling the stream roughly 200-300 feet from the top of bank.

Following the main channel north across Mill Road the prevalence of sinks appears to increase slightly though the white features do not. The left descending bank is poorly defined and frequently intersected by multi-thread gully complexes. In some cases the gully complexes bracket both banks. Large abandoned oxbows and sinks with surface water are particularly notable in the area about 4000 feet downstream of the N 1st Street crossing and between N1st Street and Raymond Road. Approaching N1st Street the channel has been widened for the bridge and the eroded banks show deep crow’s foot gully complexes and crenellated bank toes. About 250 feet downstream of Raymond Road, the top of bank on the inside of the meander is as eroded as the outside bank.

In-channel bars become more common upstream of Raymond Road. The apparent vegetation on the bars and their longitudinal orientation may indicate geotechnical bank failures rather than fluvially deposited features.

Large open water features flank the stream approaching NW12th Street and white features again appear on the over bank. As was the case downstream most of these features are well outside the channel. Beginning about 2200 feet downstream of NW12th Street and extending to within a few hundred feet of NW12th Street, bright white features appear

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along the top of the banks (most commonly the left descending bank) Approaching NW12th Street Bridge there are multiple side channels. About 1200 feet upstream of NW12th Street a partial channel obstruction impounds water and the stream width increase by about 50% upstream of the obstruction. The riparian corridor changes at this point becoming lush though very narrow and bound by tilled fields. Trees appear at the top of bank approaching Branched Oak Road as do more channel obstructions. Tilled areas are much closer to the creek than in downstream areas. This is the interface between Salmo silt loam and Nodaway silt loam. Between Branched Oak Road and NW19th Street there are at least 3 stream structures (possibly beaver dams). Moving upstream several more structures occur. The woody riparian corridor is dramatically improved as the stream flows through the Nodaway silt loam.

Approaching Davey Road the photo depicts an extreme hairpin meander. The ratio of the radius of curvature to the low-flow channel width seems to be less than 2, a ratio lower than is typical. The forest cover obscures the channel but the stream width seems to vary considerably through this reach. Upstream of Davey Road, the channel plan form nearly doubles back upon itself. Although the vegetation is markedly different in the Nodaway soil, the gullying continues and this part of the basin bears a stronger resemblance to classical Aeolian landforms. The gullies appear deep with heads that appear as deep (or nearly so) as the stream junctures. The tree cover obscures the channel bed however, where farm practices have denuded the bank, large bank failures are clear. This is especially notable 1500 and 1800 feet downstream of Rock Creek Road.

About 3000 feet above Rock Creek Road there is a striking erosion feature on the right descending bank over bank. Deep gullying and long, linear erosion features parallel to the stream become more common continuing north where the channel and over banks take on more of the characteristics of dispersive soils seen in the southern part of the basin. However this reach is not in Salmo soils; the parallel erosion features are predominantly in the Judson silt loam.

Approaching Agnew Road, the water appears silt laden with an area of green growth on the water about 400 feet downstream of the Agnew Road crossing. The banks are slumped with a complex cross-section incorporating a web of gullies. The over bank is sparsely wooded and again bears a resemblance to that observed far downstream. North of Agnew Road agricultural land encroaches to within a few feet of the top of bank and failures of the denuded banks are extensive. Moving upstream the meanders are tight and gullies deep. Where farm practices have eliminated the riparian corridor and altered the alignment, the channel appears as a deep straight trench.

Approaching Little Salt Road culvert, the channel appears previously straightened and is reacquiring some meandering plan form. Just downstream of the culvert on the right descending bank is a large area of recent land clearing. Upstream of Little Salt Road crossing the right descending bank appears completely stripped.

The headwaters are in very poor condition. Most have been plowed over or straightened.

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TRIB 20, Eastern Tributary (confluence between Bluff Road and Waverly Road; just west of N 27th Street)

Rough estimate of channel length – 28,000 feet.

Unlike the main channel, the eastern tributary does not flow through Salmo soils. It flows primarily through Kennebec and Nodaway silt loams. However the terrain appears barren and nearly treeless with a distinct mottled appearance. The white features are less common and less pronounced in the lower part of this tributary than in the main channel. However, near the confluence there are white features on both over banks generally associated with gully complexes. The pattern of crow's foot gullies characterizes this reach of tributary as it does the main channel. Approaching N 27th Street, the stream has been channelized, a diversion which shortened the stream by about 500 feet.

The channel appears deeply incised with significant bank retreat on the right descending bank. Proceeding upstream there appear to be extensive in-channel bars which may be geotechnical rather than fluvial in origin. Where agricultural activity encroaches on the channel especially deep gullies occur. Mid and upper bank retreat along both banks is common. Meanders are often unsustainably tight with evidence of adjustment. This is likely to affect the adjacent farm fields. Approaching the confluence of the tributary with two sub-tributaries, the retreating banks have the appearance of weathered rock.

TRIB 220, Eastern sub-tributary – The lower part of the channel flows parallel to Waverly Road and the alignment appears to have been manipulated. Meander amplitude is quite low along this reach and there is some evidence that the meanders are adjusting. The current alignment is more sinuous than the GIS track indicates; moreover the current channel plan form is generally shifted downstream relative to the GIS track. This is consistent with meander migration. White features are not readily discernable in this reach.

Upstream of Waverly Road the pattern of poor riparian vegetation, pronounced gullying, and increased sinuosity relative to the GIS track continues. Roughly 1000 feet upstream of Waverly Road the stream flows through an area of Nodaway silt loam almost completely devoid of vegetation. Here erosion features run generally parallel to the stream and there appear to be quite a few felled trees. Obstructions in the channel have caused impoundments with an in-channel pond. In this reach there is a clear tree scroll indicating an abandoned channel and a meander-shaped open water feature. The impounded area (measured along the presumed thalweg) is about 500 feet long.

Approximately 1000 feet downstream of N 40th Street there is a sink about 140 feet to the west of the channel. The upper slopes of the sink display a crow's foot gully pattern.

Upstream of N40th Street the sub-tributary has a much better riparian corridor. The upstream 2200 feet has a nearly closed canopy thereafter, the canopy narrows dramatically and north of Mill Road, the tributary is reduced to a ditch in plowed fields.

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TRIB 20, Northern branch – Most of this tributary flows through Nodaway silt loam. From the confluence to Waverly Road, the stream flows through poorly vegetated land with virtually no trees. Channel adjustment is apparent particularly on the descending limb of the first meander upstream of the confluence with the main tributary. The culvert at Waverly Road may be blocked with debris. There is a pronounced erosion feature about 500 feet upstream of Waverly Road with dendritic gullies along the over bank. The woody corridor is sparse to absent on the right descending bank and highly variable on the left descending bank. In-channel bars are again common. The alignment roughly parallels a tilled field and the stream may have been moved here to accommodate it. Approximately 3500 feet north of Waverly Road the stream adopts a far more sinuous course.

In the meandering reach, the bank retreat is pronounced on both banks. The banks have a weathered rock appearance and there is a 160 foot reach with near-continuous center bar.

Moving into the Lancaster photo, the image quality degrades dramatically. It is difficult to observe the channel bed; however, the bank retreat appears extensive. As in other reaches, indicators of abandoned channels sinks and oxbows are common. Proceeding north, the pattern of crow's foot gullies spanning both banks reappears and some bank failures are especially severe (about 2500 feet downstream of Mill Road). Approaching Mill Road culvert there is an area with persistent in-channel islands and a slight impoundment. North of Mill Road, the stream has been channelized.

TRIB 65, Northeastern Tributary - confluence with main channel north of Raymond Road, west of N 1st Street, south of Branched Oak Road. Rough channel length (from GIS track) – 31,000 feet.

The downstream reach flows through Salmo soil and is characterized by sparse or absent vegetation, open water features lacking obvious surface connection, abandoned oxbows, sinks and bright white features. Some white features are near the stream (about 3000 feet upstream of the confluence) others occur well away from the banks. Some gully features appear to cross both banks and extend well into the over bank area. The bank toes appear blocky in some areas and it is not clear from the photographs if the channel bars are of geotechnical origin or the result of fluvial process. Erosion features run parallel to and at the top of the stream bank. Beginning about 3500 feet upstream of the confluence, there are linear white features parallel to the top of bank. About 4300 feet upstream of the confluence, the soil type becomes Colo silty clay loam. Through this reach, the stream parallels an alternate drainage path with some open water visible. The surrounding land is slightly less mottled; however, the absence of any significant woody riparian corridor continues. Three hundred seventy feet downstream of Branched Oak Road, the stream suddenly widens from 2-3 feet to 27 feet.

Between Branched Oak Road and Davey Road, the sinuosity increases dramatically to about 2.3. The sinuosity of the southern reach below Branched Oak Road is about 1.4 while that of the upper reach above Davey Road is about 1.8. The more sinuous reaches

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flow through Nodaway silt loam and are bounded by Kennebec silt loam. The downstream limit of the most sinuous reach is bounded by Colo silty clay loam. Although this reach lacks a continuous woody corridor, there are more trees near the stream than in the downstream reaches. In many cases, the tree lines appear to mark abandoned channels.

Moving upstream through the sinuous reach, the channel width and visible surface water vary considerably. A small sub-tributary flows in from the northeast. The characteristics of this stream are very similar to the larger tributary. As in other reaches evidence of alternate or abandoned channels is abundant.

North of Davey Road, as in some other reaches, the stream channel is more sinuous than the GIS track and seems shifted slightly downstream. This reach flows through Nodaway silt loam bounded by Judson silt loam on the left descending side and Sharpsburg silty clay loam on the right. The general pattern is consistent with much of the drainage basin. The channel is sinuous, incised with near vertical banks at the toe and mid slope with some areas of considerable bank retreat at the top of bank. Farm activity encroaches close to the stream and sub-tributaries have often been ditched or impounded. About 3600 feet upstream from Davey Road, the stream achieves a genuine riparian corridor at least one hundred feet wide and in places almost 500 feet from top of bank. The dense woody corridor persists for about 1800 feet until the stream is crossed by NW12th Street. Thereafter, the stream is bounded by a narrow corridor ranging from a single tree to roughly 30 feet on a side. This sparse corridor declines north of Rock Creek Road; however, about 2000 feet north of Rock Creek Road, the stream regains a much wider, denser corridor until about 1000 feet south of Agnew Road. TRIB 265 flows to the east of NW12th Street and remains in at least some sort of woody corridor well north of Rock Creek Road.

TRIB 15, Southwest Tributary – Confluence with main channel north of Arbor Road, south of Bluff Road

The tributary flows through Nodaway silt loam from the headwaters north of Bluff Road to about 2700 feet upstream of the confluence when it flows through Salmo silty clay loam then Salmo silt loam at the mouth.

Proceeding upstream from the mouth, the channel is deeply incised with considerable bank retreat particularly at the upper bank. White features are evident in drainage features parallel to the channel, along deeply incised tributaries and in or near the many open water features that border both banks. The gully heads appear steep and in some cases the gullies appear deeper at the head or mid-section relative to the confluence with the tributary. White patches are also apparent near the edges of surrounding farmland. TRIB 115 flowing from the northwest has been impounded to produce two lakes east of N14th Street. The downstream reach of the sub-tributary appears substantially shallower than the upper reaches. The soils that have not been tilled have a mottled appearance and scant vegetation. The first 2800 feet of tributary has no discernable woody vegetation within 200 feet of the stream and the corridor is very sparse for 1000 feet beyond that.

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Moving upstream the Nodaway silt loam does not have the isolated open water features, sinks or white features that are prevalent in the Salmo series. However, the creek remains deeply incised. The tree cover improves considerably for about 3000 feet before giving way to a reach with virtually no vegetation. This reach has close encroachment by tilled fields. Despite the poor condition of the banks, center bars or other evidence of rapid bank adjustment are not apparent. There is a reach of highly sinuous channel ($S \approx 3$) about 4000 feet from the confluence. Downstream, the Nodaway silt loam through which the channel flows is bounded by a more resistant Kennebec silt loam. It is possible that the more resistant layer has slowed the meander advance and produced a compressed wave form.

The 1400 feet downstream of N14th Street appear to have been straightened. A small reach seems to have been relocated through the Crete silt loam rather than the Nodaway silt loam through which the rest of the tributary flows.

West of N14th Street, agricultural activities encroach to or near the top of bank and top of bank vegetation is sparse. Gullies are common in one case with a density of one major gully per 20 feet of bank. For approximately 2500 feet beginning downstream of N 7th Street and up to the crossing, the stream flows through almost a denuded landscape. The soils map indicates Nodaway silt loam but the land supports very little vegetation. Gullies do not appear notably denser than elsewhere in this basin but the path of alternate channels is very clear.

West of N 7th Street the stream has been channelized for about 2000 feet and flows through a negligible or absent woody corridor. Tilled fields encroach up to the top of bank and bank retreat is common.

West of N1st Street, the stream has a more sinuous plan form and a slightly better riparian corridor though the deep incision persists.

North of West McKelvie Road the stream is very small, appearing only about 4 feet wide. Approaching Bluff Road, a reach about 1800 feet long has almost no discernable surface water though the stream course is easily visible. Surface water re-appears north of this losing reach until Bluff Road north of which surface water is no longer apparent.

Channel Observations – 1949 Aerial Photographs (black and white)

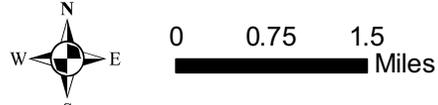
The available photographs have a significant gap in coverage from the confluence with Salt Creek to about present-day Arbor Road as shown in Figure E-3.

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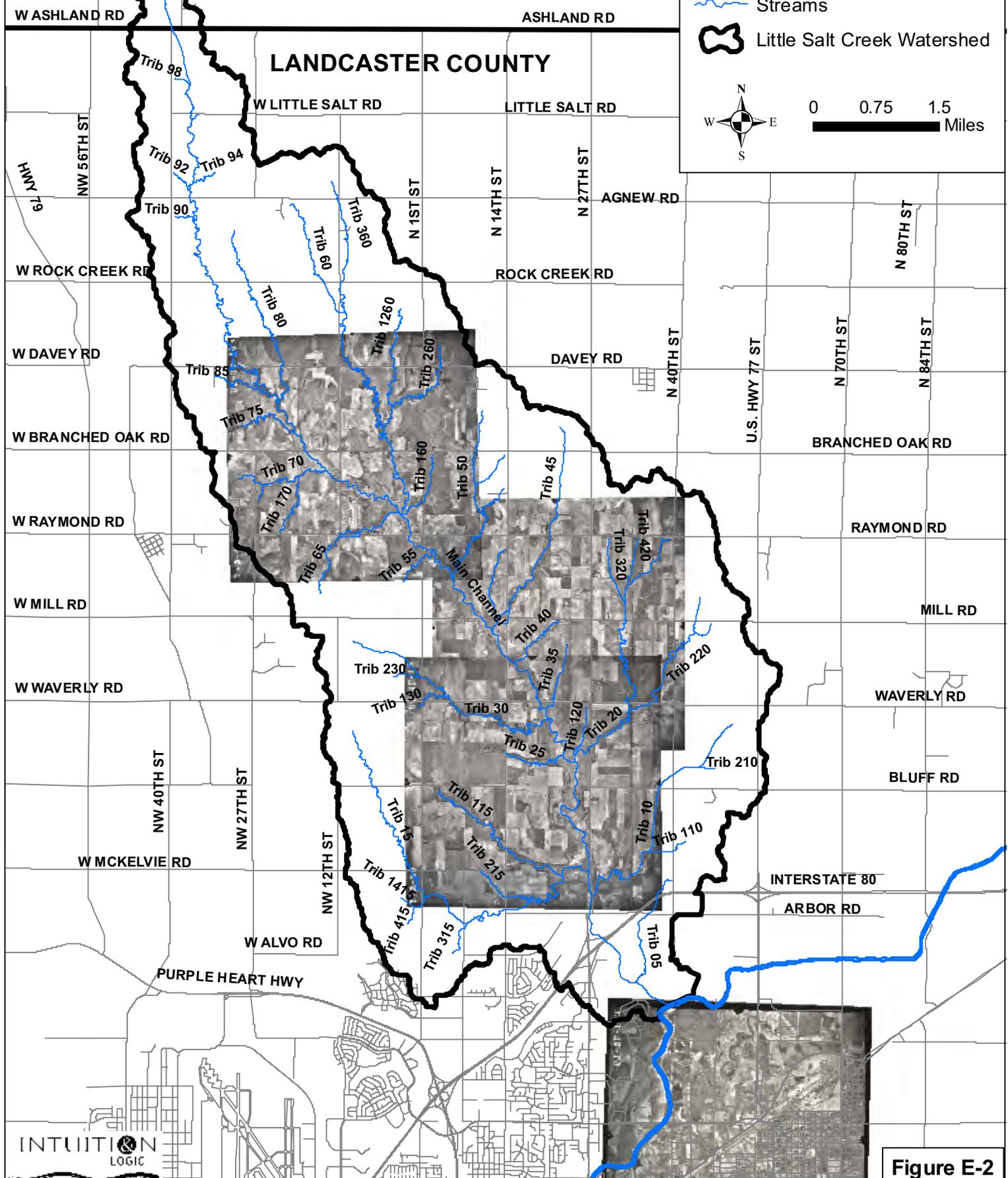
Little Salt Creek 1949 Aerial Photo Coverage Map

Streams

Little Salt Creek Watershed



0 0.75 1.5 Miles



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Figure E-3: 1949 Aerial Photo 15.

Photo 15 – The basin in this photo is almost entirely tilled fields with little terracing. There are a few farm houses but no other development. The woody riparian corridor appears to be poor or absent throughout the basin with the exception of the TRIB 20, eastern tributary which has a good woody corridor on the left descending bank. Much of the Southwestern tributary is off the photo or in the extreme edge. A substantial tributary evident in the 1949 photo which joins the TRIB 15, southwestern tributary just west of the confluence is much less discernable in 2005 owing in part to an impoundment about 2000 feet to the west of the tributary confluence. In the southern part of the study main channel, open water, bright white features and sinks are at least as evident as in later years. Proceeding upstream near present-day Bluff Road there is another concentration

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of white features, sinks and bank retreat near the top of bank. Two western tributaries between Bluff Road and Waverly Road that were not impounded in 1949 are much more pronounced than in the more recent photographs. The channel sinuosity has changed very little between 1949 and 2005 and the major features of channel form are not significantly changed.



Figure E-4: 1949 Aerial Photo 79.

Photo 79 – This photo depicts the main channel north of Bluff Road to just south of the crossing at Raymond Road. The channel is incised with steep banks and poor or absent riparian corridor. The channel has some notable differences in alignment from 2005. The area just north of Waverly Road on the left descending bank appears slightly marshier than in later years and there are more isolated seeps and sinks near the stream. At Mill Road, the channel has a pronounced, tight meander the alignment of which causes a slight bend in Mill Road. In this photo there appears to be a freshly constructed cut-off channel and a dam across the natural meander. North of Mill Road there are extensive indicators of sinks, abandoned channels and isolated open water.

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The confluence with the major eastern tributary and the main channel is not shown on this photo. It seems that some channel manipulation has already occurred towards the bottom of the tributary where meanders appear truncated and confined by tilled fields. The TRIB 220, eastern sub-tributary shows signs of channelization where it parallels Waverly Road, near its confluence with the main tributary. North of Waverly Road, the sub-tributary is highly sinuous with abandoned channels, oxbows and seeps evident. These features are more clearly seen than in the 2005 photo. There is a reach of narrow woody corridor adjacent to the fields and the path of about a dozen now plowed over tributaries particularly on the right descending bank. Beginning about halfway between Waverly and Mill Roads and extending north of Mill Road, the isolated surface water and white features become more pronounced and numerous. The channel also seems to be more deeply set into the landform with wide areas of retreat at the top of bank.



Figure E-5: 1949 Aerial Photo 108.

Photo 108 – This photo depicts the main channel from south of Raymond Road to the northwest to Davey Road. The large sinks and open water features between Raymond Road and NW 12th Street are less obvious but still discernable. West of NW 12th Street there is an apparent channelized reach with a large meander cut off on the right

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descending bank and a horseshoe bend with another meander on the left descending bank cut off. The channel manipulation continues across present-day Branched Oak Road. The condition of the woody corridor improves and the degree of channel manipulation decreases approaching Davey Road.

Channel Observations – July 31, 1955 Aerial Photos (black and white)



Figure E-6: 1955 Aerial Photo 165.

Photo 165 – This photo does not depict the main channel but does show much of TRIB 15, the southwest tributary. The tributary alignment is roughly that seen in 2005 though abandoned oxbows, abandoned channels and plowed over sub-tributaries are more obvious and the channel is slightly more sinuous. The tributary is mobile and has meandered across its floodplain. The meander amplitudes and frequency have changed considerably over time.

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Figure E-7: 1955 Aerial Photo 167.

Photo 167 – This photo depicts the confluence of Little Salt Creek with Salt Creek, the lower reaches of TRIB 15, the southwestern tributary and the main channel north of Arbor Road but south of Bluff Road. The land use is both rangeland and tilled crop land. The degree to which the stream has been shortened and realigned to accommodate roadways and agriculture is striking. The channel sinuosity in the photographs is reduced by over 60% relative to the historical alignment. Some of the channelization appears recent or ongoing; there is a plug in the downstream limb of a meander just south of Arbor Road and the photo is annotated with a proposed realignment cutting off a major meander at Arbor Road and N 27th Street. Channel incision is apparent as is bank retreat. The extensive channelization left abandoned oxbows and isolated areas of marsh that had previously been connected by surface flow. The southern part of the main channel is bounded by large to massive white features flanking open water.

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Figure E-8: 1955 Aerial Photo 195

Photo 195 – This photo depicts the main channel from the channelized reach to Mill Road. The open water features and white features surrounding them dominate the downstream reach of this photo field. The channel appears deep with very steep sides. The toes of bank appear ragged and some center bars are apparent near present-day Arbor Road. Bank retreat is especially notable near the mouths of gullies and tributaries. Sinks and isolated gullies are most prominent in the lower reaches of the stream and decline somewhat approaching Mill Road.

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Figure E-9: 1955 Aerial Photo 15.

Photo 15 (1955) – This photo depicts the main channel from south of Bluff Road to north of Raymond Road. Most of TRIB 30 is also visible here. The main channel appears almost completely devoid of woody vegetation. Tilled fields, rangelands or marsh flank the channel with no apparent riparian corridor. Several hundred feet upstream of the confluence with the main channel, TRIB 30, has a woody corridor but all other tributaries are as denuded as the main channel. Between Mill and Raymond Roads, abandoned channels are especially notable and are delineated with white features. Approaching Raymond Road, the white features again increase in frequency.

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Figure E-10: 1955 Aerial Photo 47.

Photo 47 – This photo depicts the main channel from south of Raymond Road north to an area east of the Branched Oak Road crossing as well as TRIB 65, the eastern tributary from its confluence with the main channel to north of Davey Road. Just north of Raymond Road and south of the confluence, there are two substantial meanders that were eliminated by 2005. There are sinks, marshes and white features near the confluence and both streams have virtually no woody corridor. Upstream of the confluence on the main channel, the alignment is generally similar to that of 2005. West of NW12th Street the main channel appears to have been straightened. Approaching Branched Oak Road, center bars are common. The eastern tributary has an alignment similar to that of 2005 though the downstream-most major meander has migrated downstream noticeably by 2005. The impoundment south of Branched Oak Road is not evident in 1955 but a large meander just north of Branched Oak Road is. There is an active cut-off channel at the meander; the meander may have been recently channelized. About 600 feet north of Branched Oak Road, a sub-tributary that was impounded by 2005 still flows unimpeded. The sub-tributaries that meet north of Branched Oak Road have exceptionally tight meanders with roughly the same pattern as in 2005. There is some woody corridor, largely on the eastern sub-tributary extending beyond Davey Road.

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Figure E-11: 1955 Aerial Photo 49.

Photo 49 – This photo depicts the main channel from south of Branched Oak Road to north of Davey Road. This photo depicts a more dense drainage network than is apparent in the 2005 photo. Tributaries impounded by farm ponds in 2005 are revealed in 1955 as dense, dendritic drainage features. There are center bars in the main channel south of Branched Oak Road. There appears to be considerable retreat at top of bank, especially along the right descending bank. North of Branched Oak Road, the stream has some woody corridor on at least one bank though the stream still appears deeply incised. The headwaters of the small tributaries are dendritic gullies with deep, steep head ends. This is particularly noticeable in the western tributary immediately south of Davey Road.