Syllabification and Blackfoot /s/

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1 INTRODUCTION

According to Elfner (2004), Kaneko (1999), and Derrick (2005), Blackfoot has simple and highly restrictive phonotactics. When one does not factor in /s/, Blackfoot allows syllables maximally containing an optional simple onset, a nucleus with a short or long vowel, and an optional coda which may contain one short or long consonant, or a glottal stop plus true consonant sequence.

Blackfoot /s/ appears to make syllables more complex. Blackfoot morphemes may contain complex clusters, as in one variant of "slim" or ***isttsk.*** These clusters sometimes have non-coronal segments at their edges (*istts**k**)*. Also, there is very little or no data to support more complex phonotactics at the edges of words.

There is no special need to allow extrasyllabic segments at word edges. Given a theory of exhaustive syllabification, these strings of consonants all need to be parsed into syllables. The goal of the proposed research is to present an empirically adequate analysis of Blackfoot /s/ which allows the preservation of a simple syllabification system.

I begin by describing Blackfoot syllable structure, excluding /s/ sounds, in section 3. Then I describe Blackfoot /s/ in five different contexts: assibilation (section 4.1), affricates (section 4.2), singleton /s/ (section 4.3), geminate /s/ (section 4.4) and syllabic /s/ (section 4.5).

While the syllabic /s/ was never formally proposed before Derrick (2006a), Taylor (1969) strongly suggested that "the existence of geminate /s/ between stops makes a complicated syllable canon inevitable". Elfner (2004) stopped short of making the claim for a syllabic /s/, but observed "Another point to be made about /s/ relates to its acoustic characteristics, namely its high frequency and inherent 'noisiness'. This may result in /s/ acting more like a vowel and ranking higher than expected on the sonority scale." (Elfner 2004).

Using the evidence for syllabic /s/, I will argue in section 5 that Blackfoot treats syllabic /s/ much like other syllabic elements. Section 6 addresses the predictive power of my Blackfoot syllabification analysis, and issues related to sonority. I conclude in section 7 that Blackfoot syllables remain simple even when one includes /s/.

2 BACKGROUND/BASICS

2.1 LANGUAGE

Blackfoot is an Algonquian language with 8000 speakers located in southern Alberta and northern Montana (NLA, 2006, Frantz, 2006). This analysis of Blackfoot is usable for all dialects, but has been confirmed with a consultant of the Blood dialect.

2.2 PHONEMIC INVENTORY

Blackfoot has three basic vowels which are contrastively short vs. long (shown in bold, with several allophonic variations, not in bold.) The high front vowel /i/ surfaces as /ɪ/ in reduced contexts, the low central vowel /a/ surfaces as /ʌ/ in reduced contexts, and as /ɔ/ in rapid speech. The mid back vowel /o/ surfaces as /ʊ/ in reduced contexts. The high back vowel /u/ is probably a phonetic variant of long /o/[1]. Blackfoot also has long diphthongs, and the mid front vowel /ɛ/ is a reduction of the long diphthong /ai/.

[1] Taylor believed /u/ was a phoneme with no length contrast based on some apparent near contrasts with /o/ (Taylor 1969:33). An illustration of Blackfoot is planned which will contain an empirical study of both analyses (Derrick, forthcoming).

TABLE 1: VOWEL PHONETIC INVENTORY OF BLACKFOOT

	Front		Central		Back
High	**i iː**				u
		ɪ		ʊ	
Mid		ɛ			**o oː**
			ʌ	ɔ	
Low			**a aː**		

(Elfner 2005, Frantz 1991, F&R 1995, Taylor 1969)

The phonetic inventory of Blackfoot includes "a relatively small consonant inventory, which is expanded by a large number of consonant length contrasts." (Elfner, 2005). The /p/, /t/, and /k/ are unaspirated voiceless stops (F&R 1995). The /s/ consonant is pronounced sonorously and with the tongue tip up (F&R 1995). The glides *y* and *w*, and the nasals *m* and *n* are like their English counterparts. The back fricative *h* or /x/ is palatal following /i/, velar following /o/, and either velar or uvular following /a/ (F&R 1995); since this sound can be treated as a voiceless vowel with back frication noise, my transcriptions use the vowel devoicing marker [̥] only, and treat them like all other Blackfoot vowels. All nasals, stops (except glottal stop) affricates and the fricative /s/ have contrastive short and long forms (F&R 1995, Elfner 2004, Derrick 2006).

TABLE 2: PHONETIC CONSONANT INVENTORY OF BLACKFOOT

	Labial	Alveolar	Palatal	Velar	Glottal
Stops	**p pː**	**t tː**		**k kː**	**ʔ**
Fricatives		**s sː**		**x**	
Affricates		**tˢ tːˢ**		**kˢ kːˢ**	
Nasals	**m mː**	**n nː**			
Glides	**w**		**j**		

(Elfner, 2005)

Blackfoot consonantal phonotactics excluding /s/ are fairly restrictive, and well described in Taylor (1969) and Elfner (2004). A simplified discussion will begin with word-edge phonotactics, and then progress to intervocalic phonotactics.

3 PHONOTACTICS AND SYLLABIFICATION EXCLUDING /S/

3.1 WORD ONSETS

Blackfoot words always begin with one and only one short consonant {p,t,k,m,n} which may be an epenthetic glottal stop in the case of words with underlying vowel onsets.

Despite this word-initial glottal stop epenthesis in vowel onset words, onsetless syllables exist and will be presented at the end of section 3.

3.2 GEMINATES AND SINGLETONS VS. SHORT AND LONG DEFINED

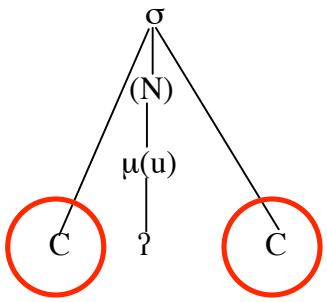
Blackfoot stops and affricates contrast for length. The long consonants have a longer duration (2:1) than their short counterparts, and can form contrastive minimal pairs[2].

All Blackfoot short consonants are singletons and the two terms will be used interchangeably. A singleton does not have an underlying mora and may be in any onset or coda position. I

[2] Minimal pairs are rare in Blackfoot - there are probably less than 300 in Frantz's entire dictionary.

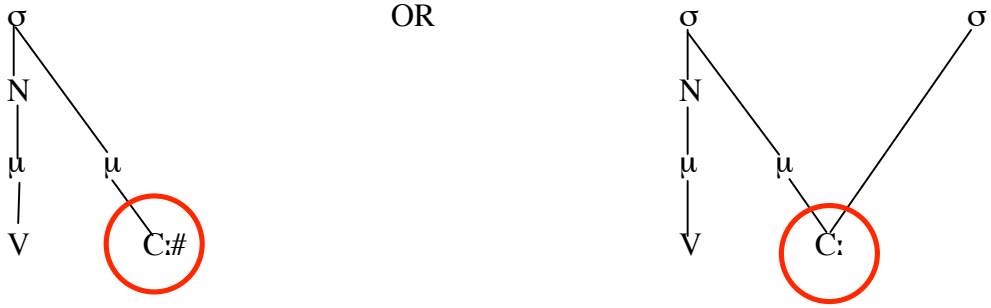
claim Blackfoot does not have weight by position contra Elfner (2004, 2005), so these singletons never bear a mora.

FIGURE 1: SINGLETON STRUCTURE DEFINED



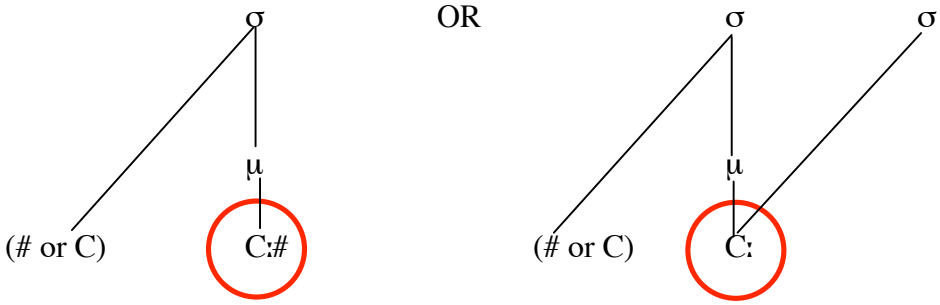
In Blackfoot, not all long consonants are geminates. In this analysis, a geminate is defined by its association with the preceding vowel - it must be a coda, and a geminate is ambisyllabic word internally. As such, their structure looks like the circled consonants (C:) below:

FIGURE 2: GEMINATE STRUCTURE DEFINED



In contrast, a syllabic consonant will not be a coda to a more sonorous nucleus. But, like geminates, syllabic consonants form the onset to a following syllable when found word-internally.

FIGURE 3: SYLLABIC CONSONANT DEFINED



3.3 WORD CODAS

Typically, Blackfoot words end in vowels. The possible consonant word codas include {p,t,k,m,n,ʔ}. Similarly, all glottal stop codas must be followed by another consonant[3]. Nasal word codas may also be geminates.

3.4 NUCLEUS

Blackfoot allows short, long, and long diphthong vowels as a syllable nucleus:[4]

[3] There are morphemes that end in a glottal stop, but their patterns of interaction are complex beyond the scope of this paper.
[4] Blackfoot has a minimal word restriction: words must have at least two moras.

FIGURE 4: VOWEL NUCLEUS SYLLABLE WITHOUT A GEMINATE CODA

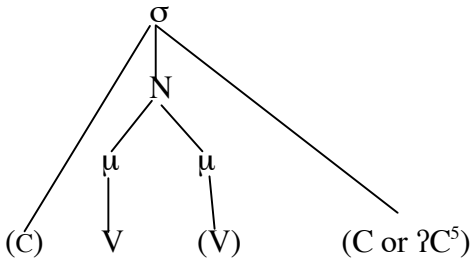
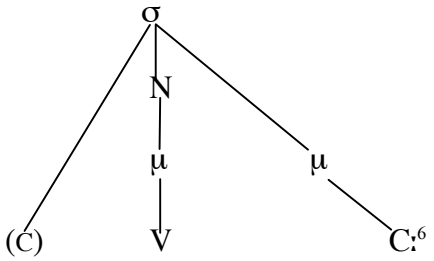


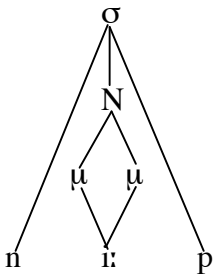
FIGURE 5: VOWEL NUCLEUS SYLLABLES WITH A GEMINATE CODA



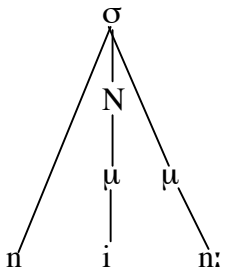
As demonstrated in these examples of long vowel + singleton, short vowel + geminate below:

FIGURE 6: EXAMPLES OF SIMPLE SYLLABLES

niip
[ni:p]
niip
leaf
"leaf"
(F&R 1995:133)
(BB 05/10/12)



ninn
[nɪn:]
n-inn
1POSS-father
"father"
(F&R 1995:61)
(BB 05/10/12)



3.5 INTERVOCALIC PHONOTACTICS

Intervocalic phonotactics in Blackfoot have a few more restrictions than word edge phonotactics, and these restrictions are predictable based on Venneman's three laws of syllable structure: Vennemann's Head Law leads to the observation that stop onsets + short or long monothong vowels make the best syllable heads (Vennemann 1988, Elfner 2004). Venneman's coda law leads to the observation that syllable codas, when allowed at all, should be simple, and if complex should end in a high sonority segment that still has lower sonority than any segments closer to the center of the syllable (Vennemann 1988, Elfner 2004). Vennemann's contact law states "A syllable contact A$B is the more preferred, the greater the sonority of the offset A and the less the sonority of the onset B." (Vennemann 1988, Elfner 2004).

Blackfoot phonotactics follow a most restricted interpretation of Vennemann's laws: There are no stops clusters at all in Blackfoot (F&R 1995), instead we get "epenthesis of a vowel ... (or) ... place assimilation resulting in a geminate consonant", but no deletion (Elfner 2004). Elfner and F&R indicate that underlying glides only separate vowels; there are no glide + con-

[5] The onset is one of {p,t,k,m,n,ʔ} and he coda is one of {p,t,k,m,n,ʔC}.

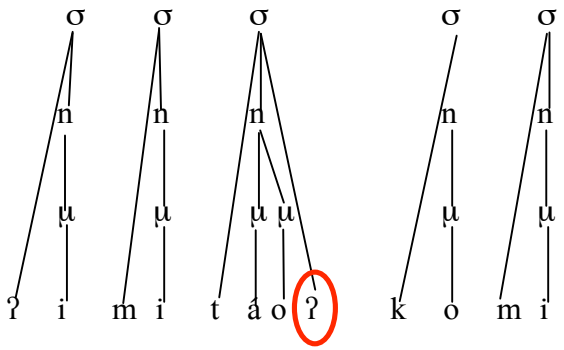
[6] The coda is one of {m:,n:} word finally and {m:,n:,p:,t:,k:} word interally.

sonant or consonant + glide sequences and glides delete next to other consonant segments in heteromorphemic conditions (Elfner 2004). Frantz's dictionary contains no nasal + stop sequences. Though Elfner suggests such sequences are possible (Elfner 2005), there are no stop + nasal sequences at all in Blackfoot (F&R 1995).

As a result, intervocalic singleton codas are highly restricted with only two types of examples. 1) Common throughout Blackfoot are glottal stop codas:

FIGURE 7: GLOTTAL STOP CODAS

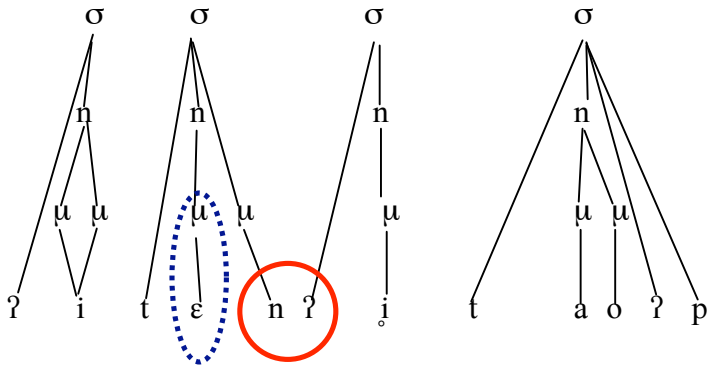
imitáó'komi
[ʔimitáóʔkomi]
imitá-o'komi
doghave lice
"flea"
(F&R 1995:56)
(BB 05/10/12)



2) Underlying nasal + voiceless vowels are separated by an epenthetic glottal stop:

FIGURE 8: NASAL CODAS

iitainnihtao'p
[ʔiːtɛ́nʔi̥tao̯ʔp]
iit-a-inn-ihta(ki)[7]-o'p
where-DUR-boil-place-IOBJ
"cooking pot"
(F&R 1995:29)
(BB 05/10/18)

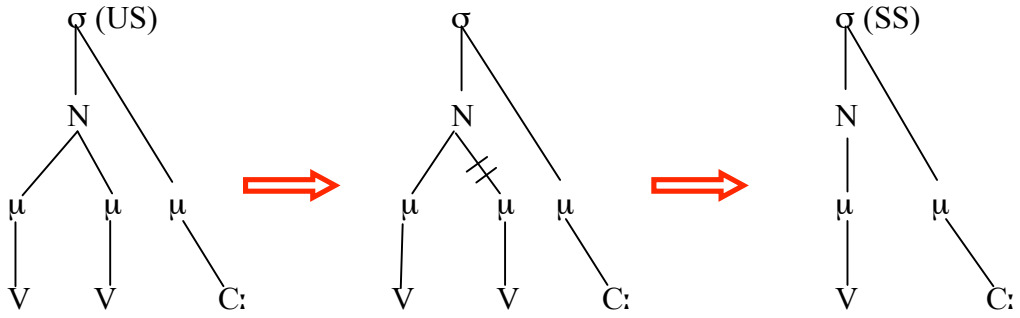


Despite violation of the contact law, the /ʔ/ is necessary because it separates the voiced nasal from the voiceless vowel preventing either from undergoing voicing change[8]. Blackfoot also has intervocalic plosive and nasal long consonants as ambisyllabic geminates.

Blackfoot syllables almost always have onsets. However, some Blackfoot words have three- and four-mora-long sequences of vowels. Based on our consultant's syllable breakdown, each syllable may have a maximum of two moras. This maximum is also supported by the effects of geminates on preceding vowels. In these cases, long vowels and diphthongs shorten and short vowels become lax, as the second syllable in "cooking pot", *iitainnihtao'p*, [ʔiːtɛ́nːʔi̥tao̯ʔp], demonstrates above - the underlying /ai/ sequence shortens to /ɛ/, as modelled in the diagram below:

[7] The morph "ihta" means lucky - the morphology of this word is not fully understood.
[8] It may also be that voiceless vowels simply cannot have true consonant onsets (Stemberber, pc)

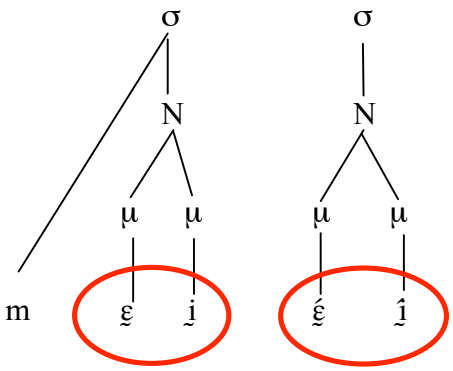
FIGURE 9: LONG VOWELS SHORTEN WHEN FOLLOWED BY A GEMINATE



The features of the delinked V delete or merge with the preceding V (Elfner, 2005). Yet long sequences of vowels still exist, leading to onsetless syllables:

FIGURE 10: ONSETLESS SYLLABLES

maaáî
[mɛ̰ḭɛ̰̂ḭ]
m-aaáî
UPOSS-robe
"robe"
(F&R 1995:121)
(BB 06/02/01)



4 BLACKFOOT PHONOTACTICS WITH /S/

There are 5 kinds of /s/ sounds in Blackfoot: 1) assibilants, 2) affricates, 3) singleton /s/, 4) geminate /s/, and 5) syllabic /s/. While affricates, singleton /s/ and geminate /s/ add complexity to Blackfoot syllabification, positing syllabic /s/ keeps this complexity to a minimum.

4.1 ASSIBILANTS

In Blackfoot, /t/ becomes /t^{s}/ before all /i/s, and /k/ becomes /k^{s}/ before most /i/s heteromorphologically (Armoskaite & Chávez 2005). In citation speech, they are about half the duration (101 ms) of a singleton /s/ in onset position (203 ms) (Derrick, 2006b). Because assibilation requires the context of a high front vowel, assibilants are all onsets.

4.2 AFFRICATES

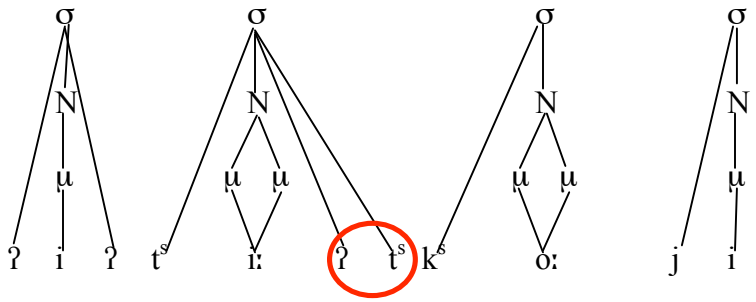
Singleton Affricates occur word-initially, word-finally, and word-internally in onsets or codas. Long affricates are limited to word-internal positions.

Since affricates are single underlying segments it is possible to have any number of them in a row, but this is rare.

An analysis of the Blackfoot word for "picnic" provides an example of a complex coda involving a glottal stop + an affricate:

FIGURE 11: GLOTTAL STOP + AFFRICATE

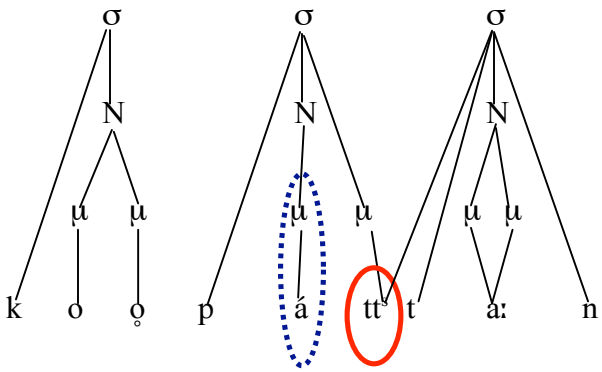
i'tsii'tsksooyi
[ʔiʔtˢʲiːʔtˢkˢoːji]
itsi-i'**tsk**-ooyi
pretty-bare-eat
"picnic"
(F&R 1995:110)
(BB 06/02/09)



There are no word-final long affricates in Blackfoot. Word-internal long affricates syllabify like any other word internal geminate in Blackfoot even when they are followed by another consonant. The Blackfoot word for "yeast bread" provides a good example of a long affricate followed by a consonant. This example demonstrates deletion of a mora from a long vowel when that vowel is followed by a long affricate: All long affricates in Blackfoot are geminates.

FIGURE 12: GEMINATE AFFRICATE FOLLOWED BY A CONSONANT

koohpááttstaan
[koo̥pátːˢtaːn]
koohpááttstaan
yeast bread
"yeast bread"
(F&R 1995)
(BB 05/11/29)



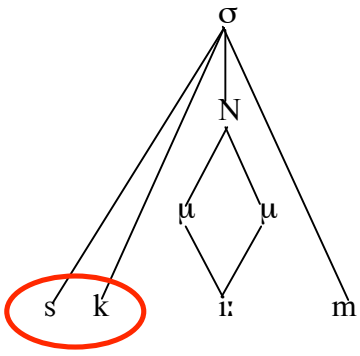
The ambisyllabic geminate provides a complex onset to the following syllable and gives us a unified description of Blackfoot data, supporting the existence of complex onsets and complex codas which we see again upon examining singleton /s/.

4.3 SINGLETON /S/

Blackfoot singleton /s/ can form simple onsets, averaging about 203 ms in duration in citation speech (Derrick, 2006b). However Blackfoot /s/ in onset position may also be part of complex /s/ + {p,t,k} onsets.

FIGURE 13: EXAMPLE OF COMPLEX ONSET

skiim
[skiːm]
skiim
female animal
"female animal"
(F&R 1995:214)
(BB 06/02/09)

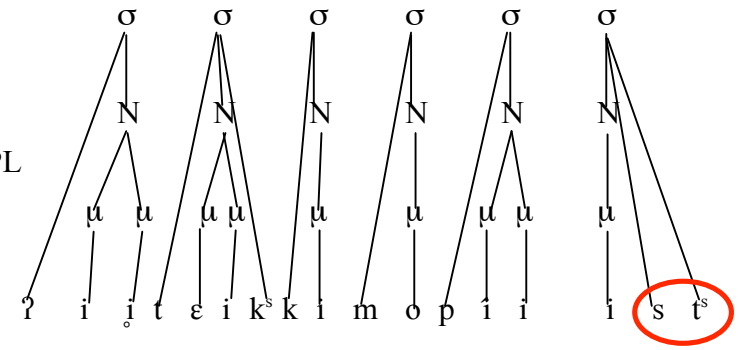


At the word final edge we see many examples of simple codas. There are also examples of complex codas with inanimate plurals (/ists/):

FIGURE 14: EXAMPLE WITH COMPLEX CODA

iihtaikskimopîiists
[ʔiiːtɛikˢkimoːpîiists][9]
iiht-a-iks-kimopi-ists
LNK-DUR-INT-place of honour-IPL
"Hunting Equipment"

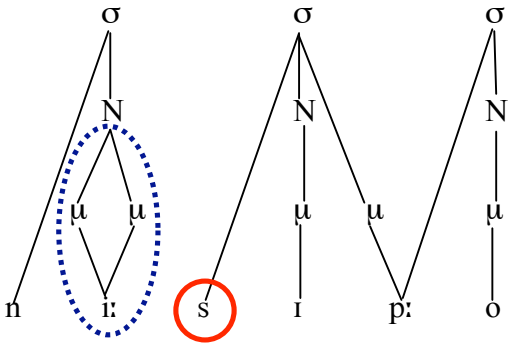
(BB 05/10/18)



Word internal singleton /s/ onsets are common. These /s/s do not act like geminates. An analysis of word internal singleton /s/ shows that they do not shorten preceding long vowels:

FIGURE 15: WORD INTERNAL SINGLETON /S/ ONSET

niisippo
[niːsɪpːo]
niis-(k)iipo
four-ten
"forty"
(F&R 1995:134)
(BB 05/10/12)

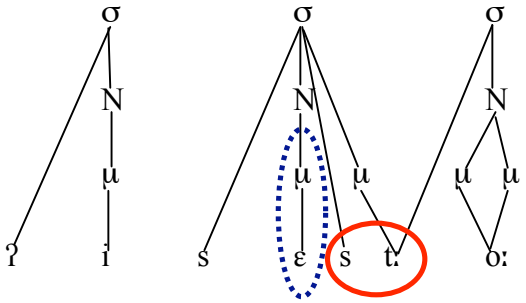


Word internal singleton /s/ codas only occur following /i/ and preceding short or long alveolar and velar stops or affricates (F&R 1995). These /s/ segments have a short affricate-like duration of 91 ms (Derrick, 2006b). However, this /s/ segment will block OCP effects allowing the formation of /kˢ/ assibilations (Chávez-Peón, forthcoming). Lastly, our Blackfoot consultant makes syllable judgments that clearly indicate that this /s/ is a separate and distinct segment.

Coda /s/ does not prevent the vowel-shortening effects of a following geminate:

FIGURE 16: /S/ CODA FOLLOWED BY A GEMINATE

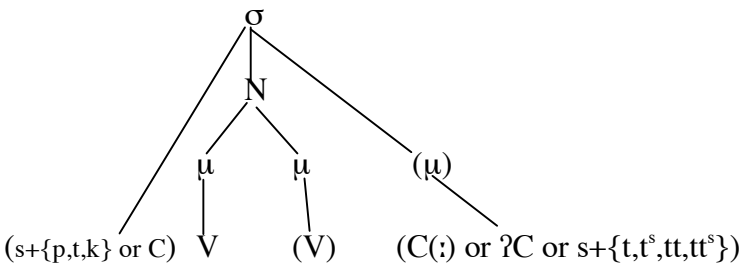
isaisttoo
[ʔisɛstːoː]
i-sa**istt**-oo
VERB-shout-go
"announce"
(F&R 1995:198)
(BB 06/02/09)



[9] I am not sure why this is a super-long /i/, but multiple tokens produced the same results, so I have transcribed those results and represent them in the syllabification analysis.

Singleton /s/ forces the addition of complex codas and onsets to Blackfoot syllable structure:

FIGURE 17: SYLLABLES WITH COMPLEX CODAS

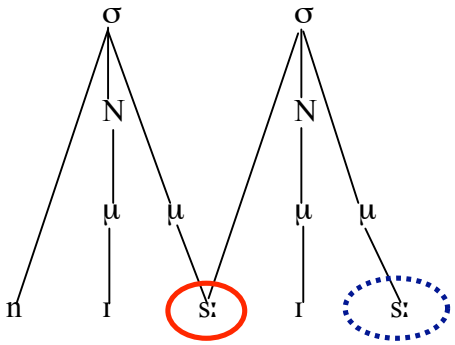


4.4 GEMINATE /S/

Blackfoot also has long /s/s that follow vowels. These occurrences of geminate /s/ can occur word-finally, or word-internally. The syllabification of geminate /s/ followed by a vowel and word final geminate /s/ is like that of any other geminate in Blackfoot:

FIGURE 18: GEMINATE /S/ FOLLOWED BY A VOWEL

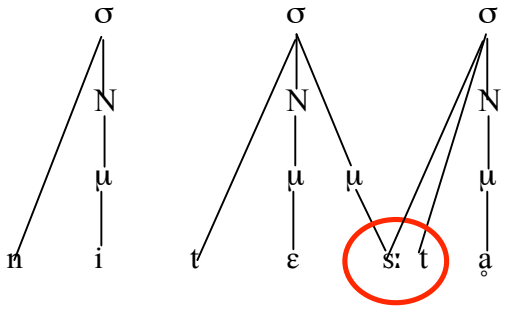
nississ
[nɪsːɪsː]
n-ississ
my-young sib of female
"younger sibling of a female"
(F&R 1995:85)
(BB 06/02/01)



Geminate /s/s may also be followed by consonants, and the ambisyllabic geminate then produces onset clusters like /skˢ/ which is otherwise unattested and /stˢ/, which is attested in the demonstrative, *stsiki* [stˢiki], meaning "another" (F&R 1995):

FIGURE 19: GEMINATE /S/ FOLLOWED BY A CONSONANT

nitaissta
[nitɛsːtaᵒ]
nit-**a-i-ss**taa
I-DUR-VERB-sucking milk
"I am sucking milk"
(F&R 1995:228)
(BB 06/03/02)



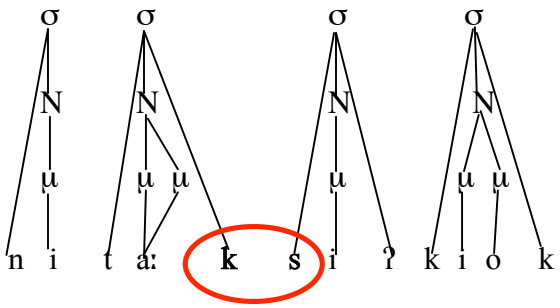
4.5 SYLLABIC /S/

Long /s/ can also occur after stop consonants, and I analyze these as syllabic /s/. Long /s/s have a duration twice as long as short /s/. Syllabic /s/ are shorter in duration (240 ms) than geminate /s/ (299 ms) (Derrick, 2006b). Geminate /s/ followed by a consonant and syllabic /s/ followed by a vowel have the same duration (Derrick, 2006b). Consonant + short /s/ sequences syllabify as expected, with the consonant as coda and the short /s/ as onset.

FIGURE 20: STOP + SINGLETON /S/

nitaaksi'kiok
[nita:**ks**i?kiok]
nit-aa**k-s**i'ki-ok
1PS-FUT-cover/tame-INV
"he will tame me"

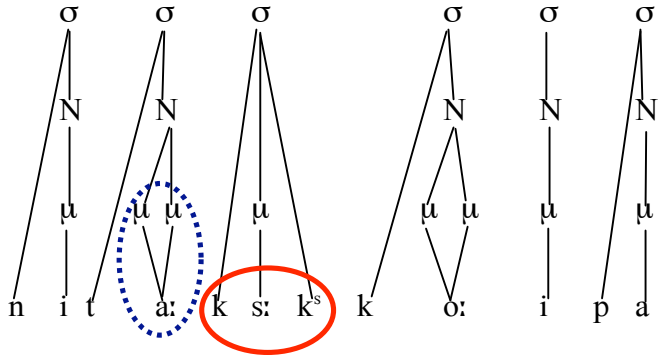
(BB 06/03/16)



The long /s/ instead forms its own syllable, analyzed here as lacking a nucleus because syllabic /s/ cannot bear tone the way vowels can. The word "I will measure (it)" provides an excellent example because the syllabic /s/ syllable has a coda as well as an onset and the preceding long vowel stays long.

FIGURE 21: STOP + LONG /S/

nitaakssskskooipa
[nita:ks:k^{s}kooipa̰]
nit-aak-sskskaa-ip-a
1PS-DUR-VERB-measure-move-3PS
"I will measure (it)"
(F&R 1995:225)
(BB 06/03/16)



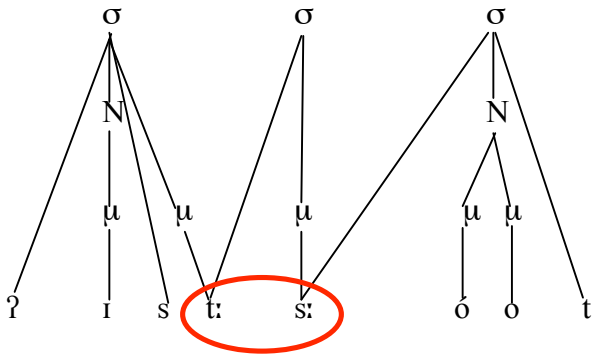
When the syllabic /s/ has no coda, it also forms the onset of the next syllable.

These syllabic /s/ syllables act much like other syllables. They can have any underlying onset except /w/; nasal + s and /j/ + s sequences are separated by epenthetic glottal stop. Syllabic /s/ can have singleton stop or affricate codas, but no long codas.

Syllabic /s/ may also have{p,t,k} long consonant as an ambisyllabic onset. Frantz & Russell's dictionary also have examples of *mmss* and *nnss* sequences, but these appear with epenthetic glottal stops separating the nasal and the syllabic /s/ (F&R 1995):

FIGURE 22: GEMINATE ONSET TO SYLLABIC /S/

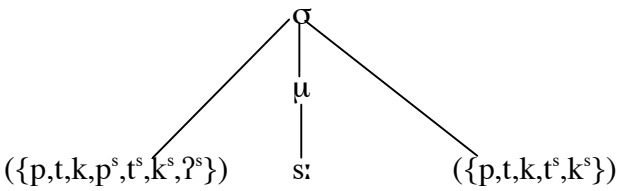
isttssóot
[ʔɪstːsːóot]
i-sttssi-oo-t
VERB-in the forest-go-CMD
"forest"
(F&R 1995:97)
(BB 05/11/23)



For an alternate analysis that suggests the long /s/ loses its mora and incorporates it into the onset of the following syllable, see Elfner (2005).

Syllabic /s/ syllables have no nucleus because syllabic /s/ may not bear tone. There are no complex onsets or codas, no nasal or glide onsets and no nasal codas:

FIGURE 23: SYLLABIC /S/ CENTERED SYLLABLES



5 DEFENDING SYLLABIC /S/

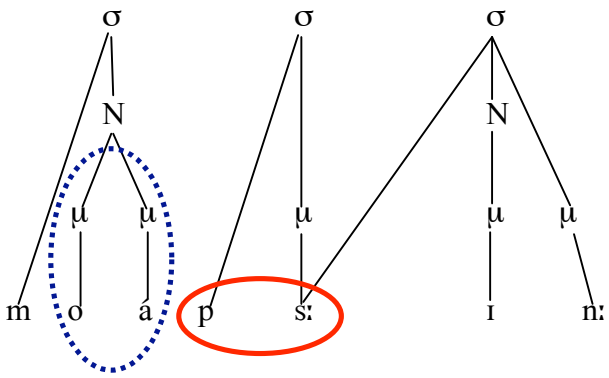
Three good arguments for syllabic /s/ include: 1) The observation that the only long consonant to follow a glottal stop is long /s/. 2) the observation that long vowels stay long when followed by syllabic /s/, and 3) Blackfoot allows strings of two syllabic /s/s in a row.

First, glottal stops are never followed by long consonants - except long /s/. Geminates may not follow glottal stops because the glottal stop blocks the geminate relationship to a preceding vowel. However, syllabic /s/ is not a coda to a preceding vowel and so may follow a /ʔ/ as in the word *awóíʔsstaakssin* [awóíʔsːtaːksːin][10] or "cross" (F&R, 1995).

Second, in Blackfoot long vowels may be followed by a consonant + long /s/ sequence. In these cases if the /s/ were a geminate we would expect to see the long vowel shorten as always happens with geminate /s/. We do not. The long vowels preceding the consonant + syllabic /s/ sequence remain long, as highlighted in the analysis below:

FIGURE 24: SYLLABIC /S/ FOLLOWED BY A VOWEL

moápsspinn
[moápsːɪnː]
m-oápssinn
body part-eye
"eye"
(F&R 1995:128)
(BB 06/02/09)

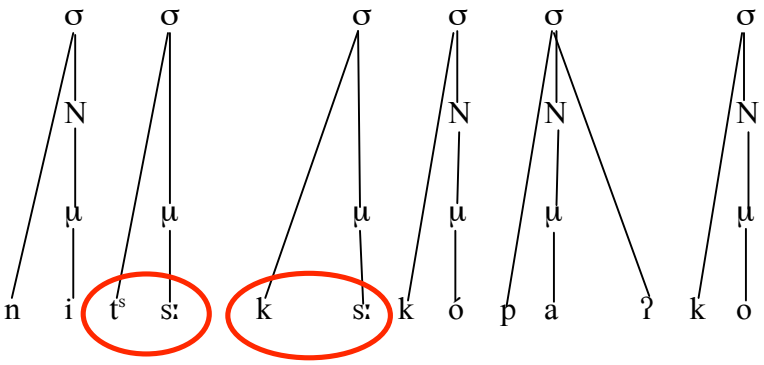


Lastly, Blackfoot allows more than one syllabic /s/ consonant in a row, and the most complex versions involve two syllabic /s/s surrounded by consonants on both sides. The syllabification of two syllabic /s/ syllables in a row would look like the example below:

[10] Predicted output. Elicitation scheduled for summer, 2006.

FIGURE 25: TWO CONSONANT BOUND SYLLABIC /S/'S IN A ROW

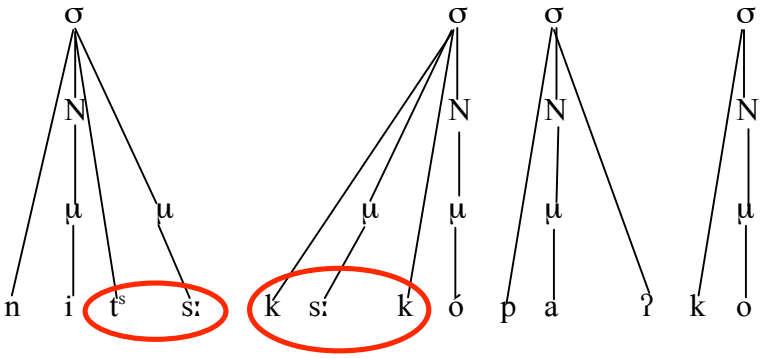
nitsssksskópa'ko
[nitˢs:ks:kópaʔko]
nit-i-tssksskópa'-ok-a
1PS-VERB-watch-INV-3PS
"she left me to watch"
(F&R 1995:226)
(BB 06/03/16)



In an alternate analysis where one assumes syllabic /s/ does not exist, the relevant segments are parsed into adjacent syllables. Let us examine that structure:

FIGURE 26: ALTERNATE ANALYSIS INVOLVING NO SYLLABIC /S/'S

nitsssksskópa'ko
[nitˢs:ks:kópaʔko]
nit-i-tssksskópa'-ok-a
1PS-VERB-watch-INV-3PS
"she left me to watch"
(F&R 1995:226
(BB 06/03/16)



In this alternate analysis, the first syllable ends with a long /s/ sequence in a complex coda and separated from the nucleus. The long /s/ does not act like a geminate because it does not reduce the preceding high front vowel /i/ to lax /ɪ/. Also, the order of the coda consonants violates Vennemann's coda law as the /s/ is higher in sonority than the preceding /tˢ/ spirantization. While /s/ is often an exception to this rule, as in English "axe" (Stemberger, pc), the /s/ maintains duration and therefore remains problematic for this analysis. The next syllable starts with /k/, but the onset contains a long /s/. In most syllable theories, this /s/ would lose it's mora, but there is no evidence of duration reduction. Also, the next segment is a low sonority /k/, the order of which violates Vennemann's onset law. I reject this analysis as it violates many commonly held observations about cross-linguistic norms in syllable structure.

An alternate analysis in which these segments are simply not parsed into syllables is equally problematic as it would be a violation of word prosody itself. Words that don't have syllables at all may have extrasyllabic word edges - but words that have syllables will not have syllabified edges and extrasyllabic word centers.

Lastly, our consultant is very clear on two principles 1) all of the words analyzed in this paper are single units - words, and 2) consonant bounded long /s/s are always their own syllable or "clapping unit". Our consultant will spontaneously break words into syllables in order to teach Blackfoot students how to say long and complex words.

6 DISCUSSION

A careful examination of the Blackfoot data provides two types of syllable structure - one for nuclear (vowel centered) syllables, and one for syllabic /s/ syllables. The structure for vowel centered syllables is:

FIGURE 27: BLACKFOOT SYLLABLE WITH V NUCLEUS AND NO GEMINATE CODA

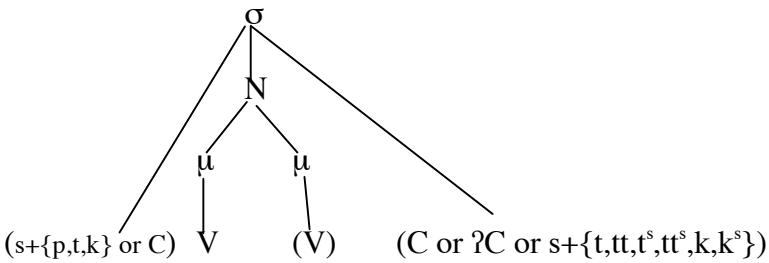
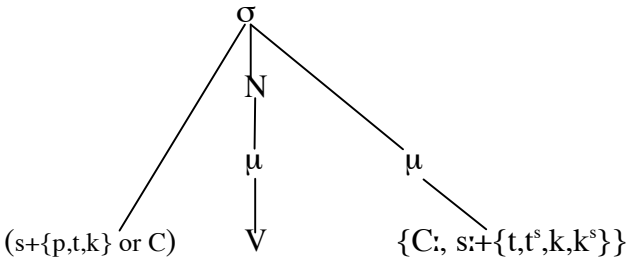
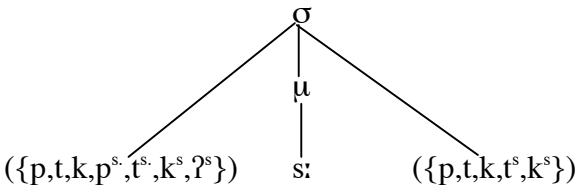


FIGURE 28: BLACKFOOT SYLLABLE WITH V NUCLEUS AND GEMINATE CODA



There are no word edge rules of any kind except that /st:/ and /st:^{s}/ is unattested word-finally. Similarly, the syllabification of syllabic /s/ syllables allows both onsets and codas. However, there are no long codas or complex onsets/codas on syllabic /s/ syllables - it would be difficult to even imagine a combination needed to produce such a thing. The analysis of possible syllabic /s/ structures is:

FIGURE 29: BLACKFOOT SYLLABLE WITH SYLLABIC /S/ CENTER



The only special edge restriction is that onsets are obligatory except word initially. Of course the reason is that a syllabic /s/ is defined as a long /s/ following a consonant word internally.

The above syllable analysis, combined with Vennemann's syllable laws, is highly predictive of Blackfoot syllable structure. However, they alone cannot exclude {m,n} codas followed by {p,t,k,s} onsets - none of which occur in Blackfoot as we do not see nasal + stop or nasal + /s/ sequences in Blackfoot (remembering that instead of nasal + long /s/ we see glottal stop + long /s/ sequences. Vennemann's laws naturally exclude {p,t,k} + {p,t,k} sequences, and they naturally exclude intervocalic /s/ + {m,n} sequences.

Blackfoot has no recorded examples of syllabic nasals (Frantz 1991, 1995; Elfner 2004). Though young speakers may be adding some into the language, people of our consultant's generation do not use syllabic nasals. Following one definition of sonority, i.e. what segments may be syllable centers, it appears that Blackfoot /s/ is higher on the sonority scale and either nasals or glottal stops. However, following Vennemann's sonority laws we see a different analysis. In Blackfoot there are no nasal or glide onsets to syllabic /s/ syllables, instead glottal stop separates the two. It would appear that glottal stop is then less sonorous than either glides or nasals, and that Blackfoot /s/ has a sonority somewhere between nasals and glottal stops. It may also be that global sonority simply cannot explain what segments may or may not be syllabic (Bernhardt & Stemberger, 1998).

Neither assessment makes sense in light of other syllabification evidence. Glottal stops appear to be more sonorous than at least nasals because of their ability to form codas next to nasal onsets. If this analysis of syllabification is correct, a universal sonority hierarchy simply does not help in identifying possible syllabic consonants.

7 CONCLUSION

I began by claiming that Blackfoot syllabification without /s/ is quite restrictive. By proposing a syllabic /s/, it is almost possible to keep the same simple syllable system, adding only a few possible complex codas and onsets.

At the cost of having to assume there is a different sonority sequence for syllable center and syllable edge sonority, it becomes possible to maintain a simple syllable model. Vowel nucleus syllables maximally contain an optional simple or s+{p,t,k} onset, a nucleus with a short or long vowel, and an optional coda which may contain one short or long consonant, a glottal stop + singleton consonant or an s + {t,tt,t^{s},tt^{s},k,k^{s}} (/s/ may be geminate if the stop/affricate is not) coda. Syllabic /s/ nucleus syllables maximally have a {p,t,k,ʔ,t^{s},k^{s},p^{s},ʔ^{s}} onset, and a {p,t,k,t^{s},k^{s}} coda.

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