1 Introduction

“It would be an understatement to say that Karok morphophonemics are extraordinarily complex (Macaulay 1989:161).”

Karuk is a highly endangered language of Northern California. The most comprehensive scholarly work on Karuk is Bright’s (1957) grammar, and Karuk has been the subject of articles on various focused topics since then. How the complex morphological system interacts with the phonological system of the language, and the principles determining affix ordering, are two aspects of the language which remain poorly understood. A better understanding of these will inform research into other aspects of Karuk, such as syntax, as well as provide interesting and challenging data to theories of morphology-phonology interactions.

The purpose of the current work is twofold: to review the known morphophonological alternations in Karuk, and to provide quantified data on affix ordering. In §2 a compendium of phonological alternations in Karuk is provided. A major part of this undertaking was to cast Bright’s structuralist phonemic descriptions in terms of modern phonological theory. This exercise inevitably raises new questions about the data which were not asked in the previous work, such as about combinatorics, static alternations, and applicability of rules to morphemes not mentioned in their descriptions. Some questions of this sort can be readily answered using a morphologically parsed and digitized text corpus. Others cannot, and this work will help prepare for targeted elicitation with speakers to fill in gaps in the text corpus data.

In §3 data on affix bigrams from the text corpus and from the online dictionary is reported. This data provides quantifiable evidence against which proposed affix orders and ordering principles in Karuk can be evaluated. Once again, we can see where gaps in the data lie, and can make those gaps priorities for fieldwork. Having a firm understanding of affix ordering will also inform efforts to make sense of the morphophonological interactions.

2 Morphologically Conditioned Phonological Alternations

In this section, a dossier of phonological patterns (other than those having to do with word-level prosody) in Karuk is presented. Morphological processes in Karuk consist of prefixing and suffixing in nouns and verbs, as well as compounding in nouns and reduplication in verbs. All these morphological operations can cause phonological changes in a stem; some of these changes are fairly general and cross-cut these categories, while others are specific to an individual morpheme.

Similar types of phonological processes are grouped together into sections, which are organized, roughly, by starting with segmental changes, moving to vowel and consonant length, and ending up with suppletion. I note throughout, where applicable, whether a given process is limited to a certain
word class, operates across word boundaries, has exceptions, operates on roots as well as in derived environments, and so on.

Sources for examples are given; if no source is listed, the word is taken from the Karuk dictionary. Occasional reference is made to Bright’s morpheme classes, i.e., affix position classes. A schema of these can be found in Appendix A. I follow Bright’s (1957) analysis of word classes, in which lexical words fall into the noun or verb class, and adjectives and adverbs are subclasses of the noun class.

Karuk words in italics are written using the practical orthography, in which /p/ is transcribed as <’>, /θ/ as <th>, /ʃ/ as <sh>, /tʃ/ as <ch>, long vowels as a doubled vowel, and geminate consonants are not transcribed. Where needed, IPA transcriptions in phonemic or phonetic brackets are used. The one exception is that glottal stops are written in IPA in the section on glottal stops, and wherever they are discussed as individual phones, in order to make them more easily readable. Karuk <v> is an “unrounded bilabial spirant” (Bright 1957:8). It can vary between glide and fricative pronunciation, and it patterns phonologically with sonorants.

2.1 Segmental Alternations

2.1.1 s ~ ʃ alternation

In Karuk, [ʃ] occurs only after front vowels and the glide /y/, with or without an intervening consonant; [s] occurs elsewhere (Bright 1957:17). The palatalization is both a static alternation in the lexicon (with the exception of a very few lexicalized reduplicated forms/loans), and an active process (obligatory verbal prefixation; variable in nominal prefixation and across word boundaries). Exceptions all consist of [s] occurring in an environment where [ʃ] is expected; [ʃ] is never found in an environment where [s] is expected.

This alternation can be seen in i-initial verbs with no prefix and the third person singular prefix, respectively, in (1a)–(1b).

(1) a. ikšuupki
   ikšµup -ku -i
   point -onto -IMPER
   ‘Point at it!’
   Source: Bright (1957:66) example sentence
b. vírí vaa vírā yitha ıḳsuupkuti pa’i̯paha.
   vírī vaa vûrā yûth a- ikšµup -ku -tih pa- ‘ipaha
   so so INTS one 3s(>3) point -onto DUR DET tree
   ‘There is one pointing at the tree.’
   Source: Julia Starritt, text “Responses to Pictures” (WB_KL-92)
c. tá néeıkshupih
   tá= ná- ikšµup -ihi
   PERF 2s/3s>1s point -BEN
   ‘He made me understand.’
   Source: Vina Smith, elicited sentence (VS-10)

The change is conditioned by the vowels of the inflectional prefix, and not the underlying root-initial vowel that they replace. Note also that the change is conditioned by the resulting contracted vowel in the case of vowel contraction as in (1c).

Exceptional words in which the palatalization process does not take place include loan words, for example sikspskich ‘seventy-five cents’ (from English ‘six bits’), and këcks ‘cake’. These words must be considered lexical exceptions to the rule.
Palatalization also fails to apply in reduplicated words in which the sequence expected to trigger palatalization only comes about as a result of the reduplication, for example *tasınsı̄r* ‘to brush repeatedly’, and *sı̄msı̄m* ‘knife, iron, metal’ and derivatives. This pattern could be explained in one of two ways. In a generative account, the palatalization rule would have to apply before the reduplication takes place. This could lead to a rule ordering paradox, however, because reduplication presumably takes place before verbal inflection, and inflectional prefixes trigger palatalization. Alternatively, the pattern could be explained by a constraint ensuring faithfulness of a reduplicant to its base.

In addition, after possessive prefixes, palatalization is subject to individual speaker variation (e.g., *nanishára* ~ *nanisára* ‘my bread’) (Bright 1957:45). Palatalization also appears to happen variably across word boundaries, as in (2).

(2) *kári xás asiktäan kinipéér chími shipnákaam kiikviiki.*

kári xás asiktäan kin- ipéér chími sipnúk -kaam kíïk- viik -i
then then woman 3>3pl- say.to OPT storage.basket -large 2pl>(>3)- weave -IMPER

‘And the women were told, “Weave a big storage basket.”’
Source: Mamie Offield, text “The Flood” (WB_KL-56)

2.1.2  \(th + s \rightarrow ch\)

When /th/ and /s/ come together across a morpheme boundary, they are replaced by a singleton /ch/, as in (3a) (Bright 1957:45). This alternation also applies in words where we would expect palatalization of *[s]* to *[ʃ]*, as seen in (3b).

(3) a. *pátth* + *-sur* → *páochuru*

‘throw’ ‘away’ ‘throw away’
Source: Bright (1957:45) example

b. *ákith* + *-sip* → *ákichip*

‘handle a soft mass’ ‘up’ ‘pick up a soft mass’
Source: Bright (1957:45) example

This process is also reflected as a static alternation in the language, because while *cc* sequences are common within morphemes, there are no words containing the sequence *ths* or *thsh*. There are likewise no words containing either *sth* or *shth* sequences. It is unknown what would result when these sequences come together across morpheme boundaries, as there are no suffixes beginning with -th.

2.1.3  **Diminutive consonant harmony**

A consonant harmony process is triggered by the diminutive and ‘pretense’ suffixes (the latter apparently contain the diminutive), which changes every instance of *th* in a stem suffixed with one of these morphemes to *ch* (as well as every *r* to *n*, discussed further in §2.2.4). The same process is triggered by *-ach*, *-ich* and *-ish* DIMINUTIVE and *hiich(va)* ‘imitation’ on nouns, and by *-ach* DIMINUTIVE and *-ichva* ‘in pretense’ on verbs. An example is given in (4). Haas (1970) notes that the consonant changes always take place with nominal *-ich* and *-ach*, but do not always occur with *-ish* alone (more than one diminutive suffix can co-occur).

(4) *kári xás mukunyyählukach úkrid*

xás mukun- yüßuth -kaam -ach u- ikriv
then 3PlPOSS- downriver.across.stream -side -DIM 3s>(>3)- live
‘And a man lived downriver across-stream from them.’
Source: Lottie Beck, text “The Story of Madrone” (WB_KL-35)

In nominal compounds where the second element contains a diminutive suffix, the first element normally undergoes the same consonant harmony, although Bright notes exceptions, especially with the th to ch change (Bright 1957:77).

2.2 Nasalization

2.2.1 Alternating v, r

In a lexically defined subset of Karuk verbs, stem-final v and r alternate with m and n, respectively. In the alternating stems, the nasal consonants occur before other consonants, while the oral consonants occur before vowels and stem-finally (Bright 1957:39-40). This alternation may be formalized by the rules in (5). Examples are given in (6-8).

(5) a. /v/ → [m] /__ c
   b. /r/ → [n] /__ c

Alternating:

(6) a. tá nithítv papúsihich úikam uvathìvtih
   tá ni- thítiv pa- púsihich úikam u- vathiv -tih
   PERF 1s(>3)- hear the cat.dem outdoors 3s(>3)- fight -DUR
   ‘I hear the cats fighting outside.’
   Source: Sonny Davis, elicited sentence (SD-VS-01)
  b. nithítiímtih papúsihich uum
   ni- thítiv -tih pa- púsihich uum
   1s(>3)- hear -DUR the cat.dem 3SG
   ‘I hear the cat.’
   Source: Sonny Davis, elicited sentence (SD-VS-01)

(7) a. púyava kíkuum vúra imáan tu ’ákunvar
   púyava kíkuum vúra imáan ta- u- ’ákunvar
   you see again INTS tomorrow PERF 3s(>3)- go hunting
   ‘He would go hunting again the next day.’
   Source: Nettie Reuben, text “Deer Hunting” (WB_KL-70)
  b. pakári athkuritárahiv tá kun ’ákunvanva
   pa- kári athkuritárahiv tá kun- ’ákunvar -va
   nomz- then hunting,season PERF 3pl(>3s)- go hunting -PL.ACT
   ‘When it was hunting season, they went hunting.’
   Source: Nettie Reuben, text “Elk Hunting” (WB_KL-72)

Non-alternating:

(8) a. papúsihich tá kunváthiv
   pa- púsihich tá kun- váthiv
   the cat.dem PERF 3pl(>3s)- fight
   ‘The cats are fighting.’
   Source: Sonny Davis, elicited sentence (SD-VS-01)
b. tá nithitiv papúsíhich ūikam wathívtih
   tá nithitiv pa- púsíhich ūikam u- vathiv -tih
   PERF 1s(>3)- hear the cat.DIM outdoors 3s(>3)- fight -DUR
   ‘I hear the cats fighting outside.’
   Source: Sonny Davis, elicited sentence (SD-VS-01)

Non-alternating stem-final v, m and n also all occur in Karuk, but stem-final r always alternates. Likewise, verbal suffixes ending in non-alternating v, m and n are found, but there are no non-alternating r-final suffixes. In addition, v, but not r, is found morpheme-internally preceding another consonant, that is, in coda position. Thus nasalization provides evidence for two phonologically distinct /v/ phonemes, but only one /r/.

While non-alternating versions of these consonants exist synchronically, Bright notes apparently frozen forms in which v and r are present before a vowel that can be related to other forms containing non-alternating m and n synchronically (Bright 1957:40), as shown in (9).

(9) a. tishraam -ara : tishráara
   ‘Scott Valley’ ‘pertaining to’ ‘Scott Valley Shasta Indian’
   Source: Bright (1957:40) example

   b. ápmaan -axvuh : apmaráxvuh
   ‘mouth’ ‘fuzz’ ‘whiskers’
   Source: Bright (1957:40) example

This indicates that there was likely a more pervasive allophonic alternation between these sets of consonants at an earlier point in the history of the language. However, denasalization is not an active synchronic process any longer, as stem-final m and n remain nasal when suffixed with a vowel-initial suffix or followed by a vowel-initial word in a compound (10).

(10) a. po- ikrívaam -ak : pokrívnamak
   DET- ‘house’ -LOC ‘at the house’
   Source: Vina Smith, elicited sentence (VS-08)

   b. ápmaan ikríxúpxupa : apman’íkríxúpxupa
   ‘mouth’ ‘burning’ ‘pepper’
   Source: Bright (1957:40) example

Another set of verb stems appear to end in a non-alternating r when unsuffixed and/or before a vowel-initial suffix. However, these stems actually have an underlying final vowel which surfaces before a consonant-initial suffix, so the environment for the nasalization of r never occurs in these words. All apparently r-final nouns follow this pattern.

2.2.2 General nasalization

Two nasalization processes occur generally in Karuk. First, an r changes to n following a nasal consonant (Bright 1957:39) (11). An example is given in (12), where the suffix -riik becomes -niik following an m.

(11) /r/ \rightarrow [n] / c[+nasal] ___

(12) a. kári xás kunpiip, “uum máasuum uvíktih pahúpriik”

1 Only one potential example of a non-alternating stem-final r has been found: ápuchur ‘to collapse’, of which Bright says in the dictionary entry, “meaning and form uncertain; found only in T52.74”. In the text referenced, however, the verb occurs unsuffixed, so there is no evidence that it would not in fact follow the alternating pattern.
kári ×áś kun- piip uum máasuum u- víik -tih pahíp -riik then then 3pl(>3s)- say 3SG up.creek 3s(>3)- weave -DUR pepperwood.tree -place ‘And people said, “She’s weaving in the pepperwood grove, up the creek.”’
Source: Mamie Offield, text “The Devil Discovered” (WB_KL-62)

b. víriv uum tishrám niik pakuníxtiivhitih
víriva uum tishrám -niik pa- kun- ixtívhi -tih and.so 3SG clearing -place NOMZ 3pl(>3s)- play -DUR ‘They played it on a level place.’
Source: Julia Starritt, text “The Shinny Game” (WB_KL-78)

As can be seen in the example in (13), alternating v triggers this change, the same as non-alternating nasal consonants do.

(13) pani’ábootih papúufich uum pamu’asíimnaam tá nimah
pa- ni- ’áhoo -tih pa- piúufich uum pa- mu- ’ásiv -raam tá ni- NOMZ- 1s(>3)- go -DUR DET- deer 3SG DET- 3sPOSS- go.to.bed -place PERF 1s(>3)- mah see ‘When I was walking, I saw the deer’s bed.’
Source: Sonny Davis, elicited sentence (SD-VS-02)

Secondly, a word-final v or r becomes nasal when the following word begins with m or n, respectively (Bright 1957:54-55) (14). Both alternating and non-alternating oral sonorants follow this rule, as do consonants followed by a stem-final vowel under suffixation.

(14) a. v → m / ___#m
b. r → n / ___#n

(15) a. uthániv mupíimach : uthánim mupíimach
‘he lies’ ‘next to him’ ‘he lies next to him.’
Source: Bright (1957:54) example
b. vírusur nikániikhu : vírusun nikániikhu
‘bear’ ‘I shoot’ ‘I’ll shoot a bear.’
Source: Bright (1957:55) example

The across-the-board nature of this change and its occurrence across word boundaries indicate a postlexical process. The sequence of identical consonants created by this process is exempt from the degemination that usually takes place when identical consonants come together across word boundaries.

2.2.3 Nasalization with imperative

The imperative in Karuk has three different phonologically conditioned forms, one of which consists of nasalization of stem-final -r and -v, occurring only in verb stems ending in these consonants, as in (16)2. Imperative nasalization occurs in stems ending in both alternating and non-alternating -v. Imperative nasalization also occurs in stems ending in alternating -r and those -r-final stems followed by a vowel when suffixed (the vowel does not surface in the imperative forms) (Bright 1957:65-66).

The other imperative allomorphs are a zero allomorph (following long vowels), and the suffix -i (the elsewhere case). No nasalization is associated with the other allomorphs of the imperative.

2The other imperative allomorphs are a zero allomorph (following long vowels), and the suffix -i (the elsewhere case). No nasalization is associated with the other allomorphs of the imperative.
This indicates that this nasalization process targets the surface, not underlying forms. Nasalization in these cases is stem-final only; no other sonorants in the stem are affected. Examples are given in (17-18).

(16) a. $v \rightarrow m$
   b. $r \rightarrow n$

(17) Alternating $r$

a. *ithyur n̥kvaareesh*

   ithyur ni- ikvar -avish
   car 1s(>3)- buy -FUT

   ‘I’m going to buy a car.’
   Source: Vina Smith, elicited sentence (SD-VS-02)

b. *x̱s uthuyāngati īpa kóo kumīpeerat “ikvan!”*

   x̱s u- ithuyāana -tih īpa kóo kum- īpeer -at ikvar-N
then 3s(>3) call.by.name -DUR PAST all 3pl(>3s) tell -PAST buy-IMPER

   ‘And he was naming all that they had told him to buy.’
   Source: Julia Starritt, text “How the Rube Family Was Named” (WB_KL-66)

(18) Alternating $v$

a. *x̱s tu’āv*

   x̱s ta- u- av
then PERF 3s(>3) eat

   ‘Then he ate it.’
   Source: Mrs. Bennett, text “Screech Owl and Coyote” (ALK_14-35)

b. *chéemyach chími nu’am!*

   chími av-N
quickly OPT 1pl(>3) eat-IMPER

   “‘Quick, let’s eat!’”
   Source: Julia Starritt, text “The Bear and the Deer” (WB_KL-32)

2.2.4 Nasalization with diminutive/pretense affixes

A different nasalization process is triggered by the diminutive and ‘pretense’ suffixes (the latter apparently contain the diminutive). This is a consonant harmony process which changes every instance of $r$ in a stem suffixed with one of these morphemes to $n$ (as well as every $th$ to $ch$, discussed in (2.1.3)). The same process is triggered by -ach, -ich and -ish DIMINUTIVE and hiich(va) ‘imitation’ on nouns, and by -ach DIMINUTIVE and -iichva ‘in pretense’ on verbs. Haas (1970) notes that the consonant changes always take place with nominal -ich and -ach, but do not always occur with -ish alone (more than one diminutive suffix can co-occur). A nominal example is given in (19) and a verbal example is given in (20).

(19) *x̱s s̊aamvaniihič pamukunchishhii vaa káru asaxyípit tóo páriiish*

   x̱s s̊aam -variih -ich pa- mukun- chíshhii vaa káru asaxyípit ta- u-
then little.downhill -toward -DIM DET- 3pl POSS- dog thus also quartz PERF- 3s(>3)-
páriiish
be.transformed
vúra vaa kári umánathihach

vúra vaa kári u-ixrara-tih -ach
INTS so then 3s(>3)- cry -DUR-DIM

And a little downhill, their dog had turned to quartz.
Source: Mamie Offield, text “Coyote Gives Salmon and Acorns to Mankind” (WB_KL-17)

‘He was still crying like that a little.’
Source: Lottie Beck, text “The Kidnapped Child” (WB_KL-61)

In nominal compounds where the second element contains a diminutive suffix, the first element normally undergoes the same consonant harmony, although Bright notes exceptions, especially with the th to ch change (Bright 1957:77).

Unlike the other nasalization processes, diminutive consonant harmony does not target v to the same extent as r. The example in (19) shows a change in of the r but not the v in the suffix -varih. Bright notes that a parallel v → m change only takes place irregularly, in certain words. For instance, yav ‘good’, which ends in a non-alternating v, forms yámach ‘pretty’, with nasalization of the glide, and also -yáach an intensive suffix, with glide deletion (Bright 1957:78). Similarly, when the suffix -vah DISTRIBUTIVE is followed by -ich, its initial v is nasalized.

Bright describes the compounding and v~m irregularities under his description of the nominal suffix -ich; presumably we can expect the same irregularities with the other less common allomorphs/suffixes.

2.2.5 Irregular nasalization and denasalization

There are several instances of morpheme-specific nasalization or denasalization which do not follow the other more productive processes discussed above.

The suffixes -mu ‘to’ and -math CAUSATIVE are denasalized to -vu and -vath, respectively, following vowels. This alternation is unexpected even if we assume they begin with an alternating v, because these segments normally are only sensitive to the following environment, not the preceding environment. Elsewhere in the language, cv and vm sequences are plentiful. Another m-initial verbal suffix, -mara ‘to finish Xing’ clearly does not follow this pattern, but has the unexpected form -vara in one lexicalized form pamvara ‘to finish eating’ (<p-iter av ‘eat’ -mara). An m-initial nominal suffix and several v-initial suffixes do not display these behaviors.

When -tih DURATIVE is added to -sip(riv) ‘up (to height of man or less)’, the final v optionally changes to m. This is expected for a stem ending in alternating v, but with other suffixes, the v in -sip(riv) does not nasalize.

The verbal suffix ‘too much’ has two allomorphs, -iruv and -inuv, and triggers nasalization of r (but not alternating v) within stems it attaches to (Bright 1957:107). Bright states the reason for alternation within the suffix is unknown, but from the examples he provides, it appears that when there has been nasalization of r triggered in the stem, the nasalized form of the suffix is used. The nasalized suffix also appears in a stem in which there is no r to nasalize.

The plural action suffix -va has a -na allomorph that occurs when it follows certain suffixes. The suffixes that condition the -na allomorph must be lexically determined (they are all directional suffixes, and seem to all contain an r and/or a v, but there are other directional suffixes fitting this description that condition the -va allomorph). Nasalization of r occurs in certain preceding suffixes when -va (not -na) is attached to them (e.g., -furuk ‘indoors’ → -furuk). Most stems suffixes containing an r do not undergo nasalization when this suffix is attached, however. As discussed

---

3 The other suffixes in which an r becomes nasalized are -kara, and -kiri, but these are to be expected because the final vowel that occurs in these forms is deleted when -va is added. Thus if vowel deletion occurs first, the r becomes stem final and follows the regular nasalization pattern before a consonant.
further below, the -va suffix in particular triggers unusual and irregular allomorphy in suffixes it attaches to.

The suffix -rav ‘in’ combined with the -a deverbative suffix usually becomes -ram. Bright surmises that this may be due to contamination with the affix -ra(a)m ‘place’ (Bright 1957:116). Both these suffixes are verbal suffixes with considerable possible overlap in usage. The nasalization does not occur when -rav is followed by other vowel-initial suffixes, e.g., -ak locative.

2.3 Glide Deletion

2.3.1 Intervocalic glide deletion

Glides v and y are deleted when between vowels in derived environments. Alternating v is exempt from this process. This process feeds vowel coalescence (see 2.8 for more on this process), as can be seen in the examples in (21).

(21) a. deletion of y
   kári xás áapun tóo yvéesh āpuxuun
   kári xás áapun ta- u- iyv- ish pa- xuu
   and then on the ground PERF- 3s>(3)- pour down DET acorn soup
   ‘Then she poured the acorn soup down on the ground.’
   Source: Mamie Offield, text “How Deer Meat Was Lost and Regained” (WB_KL-33)

b. deletion of v
   ipít ñp ñkam pa’ákviish ñkreet
   ipít ñp ñkam pa- ákviish u- ikriv- at
   yesterday PAST outdoors DET- wildcat 3s>(3)- live -PAST
   ‘There was a bobcat outside yesterday.’
   Source: Vina Smith, elicited sentence (VS-10)

c. no deletion of alternating v
   taay ti’ávat
   much PERF 2s>(3)- eat -PAST
   ‘You ate a lot.’
   Source: Vina Smith, conversation (JL-VS-01)

Double-long vowels, presumably the result of historic glide deletion and subsequent vowel coalescence, are present in some roots. However, quite a number of vgv sequences exist in roots, so the glide deletion process must not must not occur on roots synchronically. A few instances of these are given in (22).

(22) a. ávansa ‘man’
   b. űuáxrř ‘to be dry’
   c. toįimh ‘brodiaea, Indian potato’
   d. ůuů ‘to put or stick (a long object)

Both v and y occur intervocically in roots, so these cannot all be instances of the alternating v. There are over twice as many v:v:v (166) as there are v:g:v (76) sequences, which is not surprising if the v set includes both alternating and non-alternating v.
2.3.2 Suffix-initial glide deletion

The examples above showed only stem-final coda glides deleting. Morpheme-initial glides can also follow this pattern, so when -yaan ‘times’ attaches to a word ending in a vowel, the y is deleted (23).

(23) a. itha- -yaan : ithaan
   ‘one’ ‘time’ ‘once’
 b. axak -yaan : axakyaan
   ‘two’ ‘times’ ‘twice’

On the other hand, the initial y of -yâach (a combination of yav ‘good’ and -ach DIMINUTIVE) does not drop out intervocically, as seen in (24).

(24) ninivâsî vára vîtïniyâach tah
   nini- váshí vára vîtïria -yâach tah
   1sgPOSS- back INTS ridge -INTS already
   ‘My back is a regular ridge by now.’
   Source: Nettie Reuben, text “Coyote’s Homecoming” (WB_KL-02)

The initial v of -va PLURAL ACTION is sometimes deleted when it attaches to vowel-final stems, and sometimes the v is retained, but when it is retained, it is always with other irregular allomorphy occurs so that the v is not in a position for intervocalic deletion. A few examples of these are given in (25).

(25) a. -ku -va : -koo
   ‘onto vertical surface’ PLURAL ACTION
 b. -suru -va : -suroo
   ‘off’ PLURAL ACTION
 c. -faku -va : -fakva
   ‘to here from uphill’ PLURAL ACTION
 d. -rípa -va : -rípana
   ‘toward land’ PLURAL ACTION
 e. -kara -va : -kaanva
   ‘into/across water’ PLURAL ACTION

No evidence of any other v- initial suffixes losing their initial glide intervocically have been found. In fact, the allomorphs -vath of the CAUSATIVE and -vu of ‘to’ occur only after vowels.

The future marker, -avish FUTURE surfaces as -eesh after verbs ending in non-glide consonants, so we can assume that the morpheme-internal v is deleted and the suffix vowels contract into a long vowel. When a stem ends in a deleting final vowel, the stem-final vowel is lost and again -avish contracts to -eesh. When -avish is suffixed to (non-alternating) v- and y-final stems, however, the stem-final glide is lost and the stem vowel contracts with -avish, resulting in a long vowel followed by vish. At this point the suffix glide is retained and no further contraction occurs. Similarly, when a stem ends in a non-deleting vowel, the initial vowel of -avish is contracted with it, and the suffixal glide remains intact. Examples are given in (26).

(26) a. Stem ending in C
   ninshxâar eesh
   ni- shxâar -eesh
   1s(>3)- go.fishing -FUT
   ‘I’m going to go fishing.’
   Source: Vina Smith, elicited sentence (LA-VS-01)
b. Stem ending in non-alternating v
   či níkrávěesh
   či ní- ikráv -avish
   soon 1s(>3)- grind -FUT
   ‘I’m gonna grind (acorns) soon.’
   Source: Lucille Albers, elicited sentence (LA_02)

c. Stem ending in deleting V
   či nítákireesh
   či ní- tákiri -avish
   soon 1s(>3)- leach(acorn.meal) -FUT
   ‘I’m gonna leach those (acorns).’
   Source: Lucille Albers, elicited sentence (LA_02)

d. Stem ending in glide
   műník nithňavish
   műník ni- thav -avish
   of.course 1s(>3)- knock.down.acorns -FUT
   ‘I’ll knock the acorns down.’
   Source: Mamie Offield, text “Coyote Gives Salmon and Acorns to Mankind” (WB_KL-17)

e. Stem ending in long V
   vaa műník nútňatripaavish
   vaa műník nu- tāatripa- -avish
   that with 1pl(>3)- hook.towards.land -FUT
   ‘We’ll hook it out with that.’
   Source: Nettie Reuben, text “Coyote’s Journey” (WB_KL-01)

Bright considers -eesh and -avish separate allophones, but it would be preferable not to analyze them this way if it is possible to derive them from the same underlying form with regular phonological rules. The alternations seen with this suffix do seem compatible with the regular glide deletion rules, but in order to get the correct outcomes, we would need to limit the glide deletion process (probably actually resyllabification) to apply left-to-right and only in one iteration.

2.3.3 Glide deletion between a vowel and consonant

A non-alternating v that comes to fall between a(a) or oo and a consonant in a derived form is deleted. Alternating v is exempt from this process. If the vowel preceding the glide was a short a, it is lengthened, but its quality does not change. Other vowels do not cause a following v to drop out before a consonant, and the glide y is not deleted between any vowel and consonant. This suggests that constraints on syllable structure and glideability/deletability of vowels vary according to vowel quality.

This glide deletion process does not occur in reduplication, even if both copies of the root are followed by consonants (Bright 1957:34). There are several words in the lexicon containing an avC sequence that are not reduplicated. Most appear to be polymorphic, at least diachronically. This is somewhat puzzling, because if these words contained an alternating v, we would expect it to nasalize before another consonant, but neither process has applied.
2.4 Glottal Stop Deletion and Epenthesis

2.4.1 Underlying and surface glottal stops in vowel-initial stems

Glottal stops are phonemic in Karuk, but in roots are rare other than in initial position. A phonetic glottal stop is inserted before all word-initial vowels, but while these are phonetically identical to words with an underlying initial glottal stop, the non-underlying glottal stops will drop out in prefixation or compounding, whereas the underlying ones are retained. This is true of both noun and verb roots. I refer to those words with underlying glottal stops as glottal stop-initial, and those without as vowel-initial.

A few stems which apparently begin with underlying glottal stops lose this glottal stop exceptionally in combination with specific morphemes (both preceding and following). Bright (1957:33) gives the examples listed in (27).

(27) a. *yuup ‘eye’ + *?\textipa{p} ‘bone’ \rightarrow yuup\textipa{p} ‘eyebrow’
   b. *\textipa{aay} ‘grape’ + *?\textipa{pan} ‘end’ \rightarrow *\textipa{i\textipa{aay}} ‘grapevine’
   c. *\textipa{\textipa{\textipa{i\textipa{t}h\textipa{a}n}} ‘fir bark’} + \textipa{-\textipa{iip} ‘tree, bush’} \rightarrow *\textipa{\textipa{i\textipa{t}h\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\textipa{\texti
Irregular ? deletion in compounding  In certain lexicalized compound words in which the second element is a monosyllabic word with a long vowel and initial glottal stop in its free form, show vowel shortening and loss of the initial glottal stop in the compound. Bright notes that these changes are “archaic and are observable only in a few petrified examples” (Bright 1957:71). We can assume the changes based on corresponding synchronic forms containing the compounded element. This could possibly represent a former phonological process in the language, frozen in only a few forms, from a time when glottal stops were not phonemic.

2.4.3  ? deletion with proclitics

? deletion with pa= DETERMINER and pa= NOMINALIZER  The nominalizer pa= and the determiner pa= are homophonous, but are distinguished by slightly different accentual, gemination, and vowel coalescence effects when they are cliticized to stems.

With pa= DETERMINER, glottal stop deletion only occurs in a very specific combination: when the determiner pa= attaches to a disyllabic stem beginning with unaccented ?VCC-. This includes both underlyingly vowel-initial and glottal stop-initial stems. In this combination, the glottal stop is lost, and the adjacent vowels subsequently coalesce (see §2.8). Unlike the vowel coalescence in prefixing, however, this process does not always take place in careful speech, in which case the glottal stop may be retained (Bright 1957:121).

With pa= NOMINALIZER, glottal stop deletion occurs in a somewhat broader context: when the nominalizer pa= attaches to any word beginning with ?V- (where V is any short vowel, accented or unaccented). This also includes both underlyingly vowel-initial and glottal stop-initial stems. Again, in this combination, the glottal stop is lost and the adjacent vowels coalesce, as seen in (29), but in careful speech the process may not take place (Bright 1957:121-122).

(29)  vaa kumúuk kuníbhviithtíheesh peeshyáat peethívthaaneen tá kunpiyáhaak

váa ku- mūuk kun- ilvith híh -avish pa= ishyáat pa= that 3poss- with 3pl(>3s)- clean.fish -dur -fut DET= king, salmon NOMZ= íthívthaaneen ta kun- pikyav -ahaak land PERF 3pl(>3s)- repair -irrealis

‘They will clean the spring salmon with that, when they fix the world.’
Source: Mamie Offield, text “Coyote Gives Salmon and Acorns to Mankind” (WB_KL-17)

We can see that while glottal stop deletion and vowel coalescence with pa= bears some resemblance to that seen in prefixation, the optionality in careful speech and the fact that underlying and surface glottal stops are treated the same, make it look like a later process. It will also be noted that this process greatly resembles general glottal stop deletion found between words in rapid speech described below. However, the limited environments that it occurs in makes it distinct from the more general process.

? deletion with ta= PERFECTIVE  The degree of phonological integration of the perfective ta and a following predicate depends on the shape of the following stem.

When ta= PERFECTIVE is combined with a predicate beginning with ?VCC (where V is any short vowel, accented or unaccented), the glottal stop is lost and vowel coalescence (see §2.8) subsequently occurs between the perfective allomorph ta- and the stem vowel.

When the perfective is combined with a predicate beginning with ?VCV(V) (where the first vowel is short and the second is short or long, either can be accented or unaccented), the glottal stop is lost and the t- PERFECTIVE allomorph is attached to the stem with no vowel changes (Bright 1957:139).

These processes presumably include both underlyingly vowel-initial and glottal stop-initial stems, although only one example has been found of ta= combining with the former. This glottal stop
deletion and vowel coalescence is obligatory, even in slow speech, in contrast to the comparable process seen with pa=, and also in contrast to a similar more general process which takes place across word boundaries during rapid speech (see below). The lack of optionality with glottal stop deletion and vowel coalescence with ta makes it seem more like a prefixation pattern than that of pa=, however, the fact that it too occurs with underlying glottal stops shows that it is quite distinct.

A note about pu= NEGATIVE Bright does not discuss what results when the negator pu=, analyzed as a proclitic, precedes a vowel-initial stem. There is evidence from a few examples that pu= does not trigger glottal stop deletion. On stems that are underlingly vowel-initial, a glottal stop is present between pu= and the vowel, as in (30).

(30) víra tá paPipmähara
    víra ta    pu= ipmah -ara
    INTS PERF NEG see.again -NEG

‘She couldn’t find (the child).’
Source: Lottie Beck, text “The Kidnapped Child” (WB_KL-61)

In this respect, pu= functions phonologically as a separate word rather than as a prefix (or monosyllabic compounded word), while the other proclitics seem to act somewhere in between the two. This is interesting because pu= occurs closer to the predicate and thus might be expected to be more phonologically integrated with it than pa= or ta=, while the opposite appears to be true.

2.4.4 Other ʔ deletion

Irregular ʔ deletion with xay When xay VETATIVE precedes the sequence ʔi (remaining a separate word), the glottal stop is lost.

ʔ deletion in rapid speech In rapid speech, word-initial glottal stops are deleted when the preceding word ends in a vowel (Bright 1957:53). This process presumably applies to both underlying and surface glottal stops, although Bright only gives examples of underlying glottal stops. The adjacent vowels then undergo coalescence or one is deleted based on vowel quality and accent, as schematized in (31). If the final vowel of the first word is i or u, it is deleted and the vowel of the second word is retained. If the first vowel is a and the second vowel is unaccented, the vowel of the second word is similarly retained. However, if the first vowel is oo and the second is u, the u is deleted. See (2.5) for these processes. If the first vowel is a(a) and the second vowel is accented, vowel contraction occurs (see (2.8)). It is not clear what would happen with a long ee, ii or uu.

(31) a. i + v → v
    u + v → v
    a + v (unaccented) → v
b. oo + u → oo
c. a(a) + i(i) → éé
    a(a) + ü(u) → óó
    a(a) + ā(a) → áá

Being a rapid speech phenomenon that takes place across word boundaries, and affects underlying as well as surface glottal stops, indicates this is a postlexical process.

5In the third person singular negative, as in this example, no overt person prefix is present.
2.5 Peripheral Vowel Deletion and Mutation

2.5.1 Stem-initial vowel deletion under prefixation and compounding

Stem-initial vowels are deleted obligatorily following an prefix or compounded word ending in a vowel other than a(a) (after a(a), vowel contraction occurs instead), as shown schematically in (32).

| 32 | i + i → i |
|    | i + u → i |
|    | i + a → i |
|    | u + i → u |
|    | u + u → u |

As can be seen in the examples in (33), this process occurs in both nominal and verbal prefixation.

| 33 | a. ni- + immish → nımish |
|    | 1s(>3)- ‘cook’ ‘I cook’ |
|    | b. u- + immish → ûmish |
|    | 3s(>3)- ‘cook’ ‘he/she cooks’ |
|    | c. nani- + ápsiih → nanípsiih |
|    | 1sPOSS- ‘leg’ ‘my leg’ |
|    | d. mu- + ápsiih → múpsiih |
|    | 3sPOSS- ‘leg’ ‘her/his leg’ |

There are no examples of the rarely used verbal prefixes *iru- PLURAL* or *ku- PARTICIPIAL* that show whether or not they follow this pattern. As nouns ending in vowels other than a are vanishingly rare, examples of compounds that would fit this pattern have not yet been found.

In stems beginning with an *i* followed by a labial consonant or *xv* cluster, the *pa-* allomorph of the iterative is used. In these combinations, the *i* is deleted. As noted above, other vowel-initial stems do not undergo any vowel deletion with the iterative, because consonant-final allophones of the iterative are used.

Since it is *u*-final, the negator *pu=* would be expected to trigger vowel deletion in a following stem, rather than vowel coalescence as the other *a*-final proclitics cause. However, as noted in §2.4, *pu=* does not trigger vowel deletion on the following stem, but is followed by a glottal stop, even with vowel-initial stems.

2.5.2 Word-initial vowel deletion

Following a pause, an initial vowel in a word beginning with an unaccented *vcc* sequence is optionally deleted. This creates surface complex onsets otherwise not allowed in the language. Words with underlying initial glottal stops do not participate in this process. Therefore, we can assume that a constraint against onsetless syllables in initial position leads either to the deletion of the initial vowel, (possibly in rapid or informal speech), or else to the insertion of a glottal stop (probably in more careful speech) as described in §2.4.

As described in §2.4 in rapid speech, word-initial glottal stops are deleted when preceded by a word ending in a vowel. If the first vowel is oo and the second is u, the u is deleted.

2.5.3 Stem-final vowel deletion and mutation

**Regular stem-final vowel deletion and mutation** Like initial vowels, short vowels in open syllables at the end of morphemes in Karuk tend to be unstable, but the results vary by word class. In both nouns and verbs, long vowels are stable and are not affected by the processes described here.
In verbs, a final short vowel is retained in its underlying form only before a consonant-initial suffix. A final short vowel is deleted before a vowel-initial suffix. Word-finally, a final short vowel is deleted following a single consonant other than $h$; and it becomes $a$ following $h$ or a consonant cluster.

In nouns, a final short $a$ is retained before a consonant-initial suffix. A final short $a$ is also retained following a consonant cluster word-finally or preceding a vowel-initial suffix. A final short $a$ is deleted following a single consonant word-finally or preceding a vowel-initial suffix. According to Bright (1957:41), nouns ending in $i$ or $u$ remain unchanged in all positions. However, in full nouns, final vowels are $a$ only; final $i$ and $u$ are found only in adverbs (a subset of the noun word class). Thus it is unclear whether they undergo no changes or are never are in a position to make such a change.

Note that compounded nouns do not follow this pattern, instead they follow the same patterns seen with prefixation described above and in §2.8 when the second member of the compound begins with a vowel. When the second member of the compound begins with a consonant, there is no change to a final vowel in the first element.

As described in §2.4 in rapid speech, word-initial glottal stops are deleted when preceded by a word ending in a vowel. If the final vowel of the first word is $i$ or $u$, it is deleted and the vowel of the second word is retained. If the first vowel is $a$ and the second vowel is unaccented, the vowel of the second word is similarly retained. These changes do apply to adverbs. This set of changes indicates that final $i$ or $u$ on nouns are deleted in this context only, but are retained elsewhere.

Irregular stem-final vowel deletion and changes  An exception to the verb-final vowel patterns is as follows:

- The final $a$ of a $va$ sequence becomes $u$ preceding -$tih$ DURATIVE and (for most speakers) before -$naa$ PLURAL.

Exceptions to the noun-final vowel patterns are as follows:

- The final $a$ of the first member of a compound is sometimes lost irregularly (there is variation by speaker and by lexical item) (Bright 1957:43). Thus while the first member of a compound normally follows the pattern for prefixes, it can occasionally follow the pattern for an unsuffixed word.

- A stem-final $a$ is lost before the suffixes -$k\text{"anish}$ ‘like’ and -$v\text{"arih}$ ‘toward’, although the regular pattern dictates it would be kept before consonant-intial suffixes.

- A set of nouns have a non-dropping final $a$ following a single consonant (written in Bright (1957) with capital A), which are retained even before pause and preceding a vowel-initial suffix. The nominal suffix -$va$ INDEFINITE does not drop its final $a$, so should be included under this category.

- According to Bright, the TAM enclitics or suffixes (see below for questions about this distinction) are normally preceded by the form of the stem one would expect before a separate word rather than before a suffix, that is to say, stem-final vowels are deleted in many cases. However, the nominal PLURAL suffix allomorph -$asa$ exceptionally retains its final $a$ when -$hara$ NEGATIVE follows it, where most nominal stems ending in $a$ would not.

- When the postposition $\text{m\text{"uuk}$ INSTRUMENTAL is attached to nouns ending in $a$, they do not lose the $a$. This indicates that, in this respect, this postposition acts as if it were a suffix, not a separate word. The other postpositions follow the pattern of losing the $a$ as if they were separate words.
Based on the regular rules deleting verb stem-final vowels, the noun-forming -a DEVERBATIVE suffix in effect replaces a final single vowel of a verb stem. Many of these derivative nouns lose the final a when unsuffixed (this is not unexpected, assuming these are stems in which a follows a single consonant). Following the sequence -vhi, however, when -a replaces the i, it becomes a non-dropping a (Bright 1957:115-116).

Past tense markers ip(a) and mit(a), which are classified as adverbs and precede the predicate, normally appear in the form without a final vowel. When immediately following pa= NOMINALIZER, however, the final a is retained: pa=ípa and pa=mita. This form can also be used in place of the combination of the two morphemes: ita and mita, without an overt subordinating pa= (Bright 157:136-137). When mit(a) is used with kinship terms, meaning ‘former, late (deceased)’, both versions (with and without the final a are attested, apparently in free variation. Presence of the determiner pa= does not effect the presence of the final a in these words.

2.6  h Deletion and Epenthesis

The presence of h at the ends of and between morphemes is often conditioned by phonological, morphological, or lexical factors.

2.6.1  Word-final h-deletion

Word-final h is deleted when followed by another word, but retained before pause. This process is fed by word-final vowel deletion in nouns, with an exception. A noun ending in cvha → cv, but a noun ending in cvVha, on the other hand, → cvVh.

2.6.2  h-deletion with suffixes

Phonologically conditioned h-insertion/deletion with certain suffixes  Following non-deleting a, all a-initial suffixes have an epenthetic h inserted before them. In effect, this only applies to nominal suffixes, because the non-deleting final a are only found in nouns.

Denominal adverb-forming -hiipux PRIVATIVE retains an h after nouns ending in non-deleting a, and loses the h elsewhere. Bright analyzes this h as underlying rather than epenthetic, but there does not seem to be any compelling reason to do so, especially as it is the same pattern found with a-initial suffixes (except that this is the only i-initial suffix to follow the pattern).

When suffixed to a noun ending in VVh- ak LOCATIVE → -k and the intervening h is lost. One exception to this rule is with páah ‘boat’, resulting in páahak ‘in a boat’, where the h is retained (Bright 1957:73). A minimal word size explanation is not possible here, because the regular process applies to dáah ‘fire’, resulting in dáak ‘in fire’. Therefore, it must be considered a lexical exception.

Bright specifies that participle-forming -an PARTICIPIAL → -han after “occlusives”. The examples given show -han following ch, and -an following vowels, h and sh. This suggests that -han follows [-continuant] sounds while the -an allomorph follows [+ continuant] sounds, although no examples with nasal or oral stops have been found to determine if this feature specification is correct.

h-insertion/deletion with TAM suffixes  The TAM-marking post-verbal morphemes show variation between an h- initial form and a vowel-initial form. Bright analyzes these as enclitics which can attach to nominal or verbal stems, with the two forms being allomorphs. The epenthetic h after non-deleting a rule described above would not explain the nominal forms because the h-initial forms appear on nouns regardless of the stem ending. Following Macaulay (1989), they are analyzed here as suffixes, with the h- initial forms actually consisting of two morphemes, the denominalizer -hi

These morphemes have a variety of grammatical functions. I use the term TAM here as a shorthand to refer this set of morphemes which are all located at the end of the predicate and have similar phonological properties, and many of which express tense, aspect, or mode. This grouping also includes negation and inverse marking.
and the TAM suffix. However, there are a couple of irregularities that cannot be explained by the presence of the denominalizer. It should be noted that these morphemes are normally preceded by the form of the stem one would expect before a separate word rather than before a suffix, that is to say, stem-final vowels are deleted in many cases. These suffixes are given in (34).

(34) a. -avish FUTURE → -heesh after nominal predicates; → -eesh/-avish after verbs.
   -anik ANCIENT → -hanik after nominal predicates and after -ap INVERSE/NEG, elsewhere → -anik.
   -irak ‘where’ → -hirak after nominal predicates, after verbal predicates → -irak.
   -ara NEG → -hara after nominal predicates, after verbal predicates → -ara.

b. -at PAST → -hat after -(h)an PARTICIPIAL; -at or -hat after -ap INVERSE/NEG.

c. -aheen ANTERIOR → -heen after nominal predicates; → -aheen after verbs.
   -ahaak IRREALIS → -haak after nominal predicates and verbs ending in vowels; → -ahaak after verbs ending in consonants.

The first set of suffixes, in (34a) fit almost perfectly into the proposal that they are made up of a combination of the denominalizer and the h-less verbal suffix. The verbal suffix -at in (34b) does not follow nominal predicates. A case could be made that its form after -(h)an PARTICIPIAL could also be an instance of a hidden denominalizer. However, either -at or -hat can occur after -ap INVERSE/NEG, apparently in free variation (Bright 1957:67). This latter allomorphy is surprising, because there is no reason to ever expect speakers to analyze an -ap-marked form as nominal, and there is no apparent phonological, morphological, or lexical explanation for the variation. Note also that the h-initial form of -anik, above, is used (invariably) following -ap. It may be possible that there is a phonological reason for this variation, based on comparison with the allomorphy seen in -(h)an, above. If so, perhaps the same rule used to apply with the other a-initial TAM suffixes and has dropped out for -avish and -ara and is in the process of dropping out for -at.

The suffixes seen in (34c) differ from the others because it appears that the initial a is dropped in the nominal form. This haplology is in fact expected for these two suffixes following any h(a) sequence in a stem (see §2.11.1), so I follow Macaulay (1989) in assuming that the underlying form of the suffix is the verb form, and that the nominal form is a haplographed version of the denominative plus the suffix. The fact that -haak follows verbs ending in vowel is a peculiarity of this suffix, reminiscent of the more general rule of loss of a suffix-initial a following a long vowel.

Lexically conditioned h-insertion/deletion with certain suffixes

- The nominal postpound -rih ‘place’ → -rii when the LOCATIVE follows, and the -k allomorph of the locative is used. This follows the pattern expected for -ak attaching to a stem ending vVh, as noted above. However, it creates a paradox because the vowel lengthening seems to be conditioned by the outer suffix, while the choice of the outer suffix seems to be conditioned by the presence of the long vowel. Bright gives examples of -rih followed by another vowel-initial suffix, so it appears that this allomorphy is conditioned by -ak specifically (Bright 1957:72).

- The suffix -han ‘month’, added to numerals to form month names, displays irregular loss of h and contraction with some vowel-final stems, but not others, and with yitha ‘one’, the stem-final a is irregularly lengthened (Bright 1957:75). It is not far-fetched to assume that combinations resulting in month names would be lexicalized and display irregularities.

- The nominal suffix -ak LOCATIVE → -kan after numerals, a few k-final stems and in four lexicalized compounds.

- In a small lexical set of monosyllabic directional roots ending in ?, the ? changes to h in certain compounds. In certain other derivatives, these roots lose any final consonant, and have other irregular phonological changes (Bright 1957:83-84).
2.7 Vowel Epenthesis Between Morphemes

2.7.1 Suffix-initial vowel insertion/deletion

When affixed to a stem ending in a long vowel, an a-initial suffix will lose the a. The a is retained following all other stems. Accordingly, the noun-forming -a DEVERBATIVE has a zero allomorph following a long vowel.

The nominal suffix -sa PLURAL → -asa following v, ch, or sh; it remains -sa elsewhere. This is an unexpected phonological environment for this change. -sa alternates freely with occasional -sas when word final; only -sa occurs when other suffixes follow it.

2.7.2 Vowel epenthesis with suffixes

The directional suffixes listed in (35) have an allomorph without an initial vowel when following a vowel. This includes an underlying final vowel of a verb stem that is dropped before a vowel-initial suffix. Following a consonant, they begin with a vowel which matches the preceding vowel in the word in height and backness (a long mid vowel in preceding stem triggers a high vowel in the suffix).

The harmonic vowel is symbolized here as a.

(35) a. -(V)thuna ‘around, here and there’
    b. -(V)vraa ‘over’
    c. -(V)vrath ‘over, into a sweathouse’
    d. -(V)vrık ‘in response to motion’
    e. -(V)vrin ‘in opposite directions’
    f. -(V)vruk ‘down over’

It will be noted that most of these suffixes begin with the sequence vr. These are the only suffixes in Karuk that begin with a consonant cluster. Since a CCC sequence is not allowed by the phonotactics of the language, it is unsuprising that an epenthetic vowel would be inserted between a consonant and these suffixes. It is interesting that this vowel takes on the quality of the preceding vowel, when the other vowel/consonant alternations at suffix boundaries do not involve vowel harmony, but rather show a default to a. This suggests that the harmonic vowels seen with these suffixes are truly epenthetic vowels which are completely unspecified for place, while the stem-final and suffix-initial vowels we have seen up to now are underlying.

It remains to be explained how -vthuna fits into this pattern. It is the only th-initial suffix found in Karuk, but there are quite a number of s- and f-initial suffixes which do not receive a harmonic vowel, so there is no reason to think that a fricative would trigger this process. Generally in the language th can be found following other consonants other than s or sh, and, interestingly, v. I suggest therefore that this suffix may have originally had an initial vth sequence, triggering the harmonic vowel rule, and that the v was historically deleted but the vowel harmony process was retained in this morpheme.

2.7.3 Vowel epenthesis in reduplication

In Karuk, reduplication is used in verb stems primarily to indicate repetition of action, but intensification and plural object meanings are also possible. The reduplicant is attached to the right of the base, and appears that reduplication can be partial or complete, depending on the stem. I follow Macaulay’s (1993) account of reduplication in Karuk here, in which it is the root (or second portion) of the (synchronically frozen) bipartite verb stem that is reduplicated. This accounts for the seemingly arbitrary variation in the shapes of the reduplicants depending on the base word.

On the other hand, the fact that these suffixes pattern with other vowel-initial suffixes in vowel-lengthening processes (see §2.9.3) may be evidence for an underlying, if underspecified, vowel.
Under this analysis, there are two situations in which the reduplicant is not simply the plain root, but involves vowel epenthesis. The examples given here are adapted from Macaulay (1993).

**Epenthesis to break up a consonant cluster** When a reduplicant is of the form $cv(cvc)$, no vowel epenthesis occurs (36a). However, when a reduplicant is of the form $ccvc$, the resultant form will contain a $ccc$ cluster, which is phonotactically illicit in Karuk. An epenthetic vowel is inserted between the reduplicant and the base in these forms (36b). The vowel inserted harmonizes completely with the preceding vowel (no reduplicated forms contain long vowels, so there is no question of the epenthetic vowel harmonizing with a mid vowel).

(36)  
   a. *ikpak* ‘chop’ → *ikpápak* ‘chop up’
   b. *chatnak* ‘crack a nut’ → *chatnakátnak* ‘crack nuts repeatedly’
      *vutnus* ‘puncture’ → *vutnusátnus* ‘puncture repeatedly’

**Unexpected lexically conditioned epenthesis** There is a set of roots which unexpectedly take a vowel between the base and reduplicant in their reduplicated form, even though there is no $ccc$ cluster to break up, as in the example in (37).

(37)  
   *ikfuk* ‘crawl’ → *ikfukúfuk* ‘crawl around aimlessly’

Macaulay (1993:78-80) offers two potential explanations for the behavior this set of roots, although neither is entirely satisfactory.

A number of the roots that fall into this group (though not all) contain two consonants with the same place of articulation, and most (though not all) in the set that do not receive the extra vowel have consonants of distinct places of articulation. It is possible that the epenthetic vowels are a frozen remnant of a constraint against adjacent homoorganic consonants that was once operative in the language.

The other possible explanation is that these vocalic increments are actually former stem-final vowels (which undergo deletion in certain positions, see §2.5.3) that were lost historically in the unreduplicated forms, but retained in the reduplicated forms.

### 2.8 Vowel Coalescence

Vowel hiatus is not possible in Karuk. Two vowels of different qualities never occur adjacent to one another. As seen above, vowel hiatus is sometimes resolved by deletion of one of the vowels. Another repair is coalescence of the two vowels into a single long vowel.

#### 2.8.1 Vowel coalescence with glide deletion

When glides $v$ and $y$ are deleted when between vowels in derived forms (see §2.3), the resulting $vv$ sequence undergoes vowel coalescence. The result is what Bright (1957:33-34) terms a “double long” vowel, which is exempt from vowel shortening processes. It is not stated in his description that there is any phonetic length distinction between this type of long vowel and a regular long vowel, however. Until phonetic data is available to determine this question, I employ the term “double long” to refer to a phonological category only.

Vowel coalescence rules are given in (38), and the corresponding accent rules for coalesced vowels are given in (39). For the vowels of identical quality, Bright only gives examples of two short vowels coming together, but there is no reason to believe the results would be any different if one were long, so I include both short and long here.
2.8.2 Vowel coalescence with prefixes and compounds

As discussed above in §2.5, vowel hiatus is also avoided when two vowels come together through prefixation or compounding. In these cases, if the first (prefix) vowel is an i or a u, coalescence of the two vowels does not occur, rather, one of the vowels is deleted. However, if the first (prefix) vowel is an a, coalescence takes place following the same rules given in (38). This applies to any underlying a, whether it is one that would delete word-finally or not. The pertinent rules are repeated here in (40), and an example from compounding is given in (41).

(40)  
a(a) + i(i) → ee
   a(a) + u(u) → oo
   a(a) + a(a) → aa

(41)  
amva ‘salmon’ + iváxraha ‘dry’ → amveeváxraha ‘dried salmon’

2.8.3 Vowel coalescence with proclitics

With pa= DETERMINER, pa= NOMINALIZER, and ta= PERFECTIVE, vowel coalescence only occurs in a specific combinations where a following (underlying or surface) glottal stop is lost, detailed above in §2.4. In all of the cases where a glottal stop is lost, the adjacent vowels coalesce following the rules in (40) above.

2.8.4 Vowel coalescence across words in rapid speech

As described in §2.4, in rapid speech, word-initial glottal stops are deleted when preceded by a word ending in a vowel. When the first vowel is a(a) and the second vowel is accented, vowel contraction occurs, following the rules given in (38) above. An example is given in (42).

(42)  
úum váa u- kúupha -nik kachakáachich
3SG so 3s(>)3- do -ANC bluejay.DIM

‘Bluejay is that way.’
Source: Phoebe Maddux, text “Bluejay Myth” (JPH_PHM-24-343a)
2.9 Vowel Length

Some morphological processes trigger vowel lengthening, others trigger vowel shortening.

2.9.1 Vowel shortening in compounds

In Karuk, nouns may be combined into compound words. If a long vowel is present in the first member of the compound, it is generally shortened, while any long vowels in the second member of the compound remain intact. More specifically, ‘regular’ long \( i, a, \) and \( u \) are shortened when in the first member of the compound \( (43a) \). However, \( ee, oo, \) and “double long” vowels do not shorten in this way in a single compound \( (43b) \). The “double long” vowels in question are those created by vowel coalescence, but may also be present in synchronically lexicalized forms. Interestingly, if the resulting compound word is used as the first member in a new compound, the long vowels that resisted shortening in the first round of compounding are then shortened \( (43c) \).

\[
(43) \begin{align*}
a. \ & \acute{i}sh ‘flesh’ + yav ‘good’ \rightarrow \acute{i}shyav ‘having a good body’ \ (Bright\ 1957:36) \\
& \acute{a}traax ‘arm’ + \acute{a}pan ‘end’ \rightarrow \acute{a}trax\acute{a}pan ‘shoulder’ \\
& \acute{p}ufich ‘deer’ + \acute{p}arámvaas ‘soup’ \rightarrow \acute{p}ufichparámvaas ‘venison soup’ \\
b. \ & \acute{i}n ‘falls’ + \acute{p}üt ‘new’ \rightarrow \acute{i}npiit ‘new falls (placename at Sandy Bar)’ \ (Bright\ 1957:37) \\
& \acute{a}tróopa ‘five’ + átiva ‘burden-basket load’ \rightarrow \acute{a}tróopaátiiv ‘five basket loads’ \ (WB\_KL-75:4) \\
c. \ & \acute{a}npiit ‘new falls (placename at Sandy Bar)’ + \acute{t}háuf ‘creek’ \rightarrow \acute{a}npiit\acute{t}háuf ‘Sandy Bar Creek’ \ (Bright\ 1957:37)
\end{align*}
\]

The pattern seen with “double long” vowels provides evidence that these are phonologically different from “regular” long vowels. I suggest that the regular long vowels contain two moras, whereas the “double long” vowels contain three. In a compound, long vowels in the first member are shortened by one mora only in each round of compounding.

Bright does not give any description of the resulting vowel when a long \( ee \) or \( oo \) undergoes double compounding. There is evidence from at least one noun that instead of becoming a short \( e \) or \( o \) (otherwise unattested in Karuk), it becomes one of the regular short vowels. In several compounds, the long \( ee \) of \( ikzaréyav ‘god’ \) (which is already a compound) becomes \( i \), as in \( (44) \). It is not known whether this is an anomaly specific to this lexical item, or a broader phenomenon.

\[
(44) \ ikzaréyav ‘god’ + árara ‘person’ \rightarrow ikzar\acute{y}aárara ‘medicine man, priest’
\]

Vowel shortening with “pseudo-postpounds” Bright describes a class of morphemes he labels as “pseudo-postpounds” as having “the tactical status of suffixes, but the morphophonemic characteristics of postpounds (Bright 1957:71).” These are bound morphemes which function like derivational suffixes, but they trigger the same phonological processes expected in compounding, not those expected in nominal suffixation. Thus, vowel shortening in the nominal stem they attach to takes place in exactly the same way described above for compounds. This set of morphemes is given in \( (45) \). Some attach to nouns, others to adjectives (classed as nominals).

\[
(45) \ “\textit{Pseudo-postpounds”}
\]

---

\( ^8 \)Thanks to Erik Maier for pointing this out to me.
Irregular vowel shortening with postpositions When the postposition *i* is attached to nouns (but not pronouns), the same vowel shortening occurs as does in compounds.

2.9.2 Vowel shortening with suffixes

All the vowel shortening processes described here apply only to regular long vowels, not “double long” vowels.

Vowel shortening in disyllabic verb roots Disyllabic verb roots that have a long vowel in the first syllable and a short vowel in the second (i.e., a *(C)VV(V)CVC*(C) structure), undergo shortening of the long vowel when a derivational suffix (except *-tti* durative) is affixed (Bright 1957:36). Verb roots with a long vowel in the second syllable do not follow this rule. Bright does not explicitly state that this process is limited to verbs, but examples of nominal derivation show that this process does not apply in noun roots. This process also does not seem to apply to deverbal suffixes.

The suffixes that trigger this shortening process, then, are the majority of verbal suffixes, including the plural and plural action suffixes, the numerous positional and directional suffixes, and various valence-changing suffixes. It may make sense to consider reclassifying *tti* durative as an inflectional rather than a derivational suffix, based its aspectual semantics as well as on this phonological process, but other phonological patterns will need to be examined before making this determination. The suffix *tti* durative occurs closer to the verb than *-ach* diminutive, which Bright also classifies as derivational – but with the admission that it could be considered either inflectional or derivational without complicating the analysis. No examples have yet been found with verbs roots of the proper shape to determine whether *-ach* diminutive triggers the vowel shortening process described here, or whether it patterns with *tti*.

Vowel shortening with certain nominal suffixes Some individual derivational suffixes regularly trigger shortening of long vowels in a preceding nominal stem (regardless of its syllable shape). There does not seem to be any phonological motivation for vowel lengthening with this group of suffixes and not with others, so this process must be considered morphologically conditioned. These suffixes are as follows:

* Adjective-forming *-ara* ‘characterized by X’
* Adverb-forming *(h)iipux privat* (-iipux after polysyllabic nouns with a short V in the final syllable, → -iipux after nouns with a long V in the final syllable and all monosyllabic nouns)
* -(m)paan, an emphatic suffix added to pronouns (e.g., námpan ‘I myself’)

In addition, while *-ich ~ ach* and *-ish* diminutive suffixes do not normally trigger vowel length changes, they cause irregular vowel shortening in combination with specific stems (e.g., tátac ‘mother’ + *-ich* → tátach ‘mama’), and irregular lengthening in combination with other stems.

Bright decomposes *puu* ‘not yet’ into *puu* ‘no’ + -va indefinite, with irregular shortening of *puu* (-va indefinite does not trigger stem vowel shortening elsewhere). However, it seems to me
that analyzing púva as a combination of pu= NEGATION + -va INDEFINITE, along the lines of púfaat ‘nothing’, etc., is the simpler explanation.

**Vowel shortening with certain verbal suffixes** Several individual derivational suffixes also regularly trigger shortening of long vowels in a preceding verbal stem regardless of its syllable shape. Some of these suffixes also fall into the group of suffixes described above that cause shortening in roots of a particular shape. Aside from -va PLURAL ACTION, these suffixes come from two groups: Bright’s Class 4 derivative suffixes (which consists mainly of valence-changing suffixes), and deverbative suffixes. There are other suffixes with similar phonological shapes in each of these groups that do not trigger this process, however, so this process must be considered morphologically conditioned. The suffixes triggering this shortening process in a regular fashion are as follows:

- -koo ‘to’
- -oo ‘habitually’
- -kiri INSTRUMENTAL ‘to use in order to X, to X by means of’
- -rih ‘up’ (rare; only one attested example showing vowel shortening)
- Deverbative noun-forming -aan AGENTIVE, ‘one who Xs’
- Deverbative adverb-forming -ra(a)m ‘place of Xing’

Irregular vowel shortening in stems is triggered by the following suffixes:

- -va PLURAL ACTION following other derivative suffixes (but not when affixed to a bare root), causes any ‘potential lengthening’ (see below) that has taken place in the stem to be reversed. At the same time, it causes lengthening in certain preceding suffixes (Bright 1957:92-93).
- -únish ‘to, at, about’ does not trigger vowel shortening except when it follows -hi DENOMINATIVE. In this case it conditions vowel shortening and is itself lengthened to -úunish.

### 2.9.3 Vowel lengthening with suffixes

Many of the verbal suffixes trigger vowel lengthening in the final syllable of the stem they attach to when certain certain syllable shape and accentual conditions are met. This vowel lengthening process is not active in nouns, with one exception. Oddly enough, the same suffix could theoretically simultaneously lengthen the second vowel and shorten the first vowel in the same stem (by the vowel shortening in disyllabic verb roots process in §2.9.2). There is no overlap, however, between the set of suffixes that trigger vowel shortening in all stems and those that trigger vowel lengthening (setting aside irregular effects of -va PLURAL ACTION).

Bright calls this lengthening process “potential lengthening” because the suffixes that can trigger it only do so under the following conditions:

- The stem ends in a consonant (underlyingly, i.e., vowels deleted before pause and vowel-initial suffixes count).
- The stem has moveable accent (i.e., does not contain a ūV or ĕCV sequence).
- If the suffix begins with a vowel, the stem-final consonant must be geminable.

---

9In one example provided by Bright (1957:108), this suffix appears to fail to lengthen a long vowel which becomes accented in the combination. This goes against the normal vowel shortening behavior. It remains to be seen whether this example is in error, or whether this suffix follows a different pattern – perhaps only that of vowel shortening in disyllabic verb roots.
There seem to be a few different flavors of potential lengthening. Without going too much into the accentual details here, I note that these are organized partly by accentual effect. The vast majority of suffixes that trigger potential lengthening also trigger “progressive accentuation” with what I term Type 1 accent behavior (i.e., resulting in acute accent on a long vowel). Suffixes that trigger potential lengthening with some other accentual effect are considered irregular. Vowel-initial suffixes that trigger potential lengthening are also considered irregular.

Regular vowel lengthening with derivational verbal suffixes

- Some, but not all consonant-initial suffixes belonging to Bright’s ‘Class 2’ (consisting of positionals) trigger potential lengthening. These are given in (46). Vowel-initial suffixes of this class do not.

  (46) ‘Class 2’ suffixes that cause vowel lengthening
  -riv ‘at rest’
  -taku ‘on or onto a horizontal surface’

- All consonant-intitial suffixes belonging to Bright’s ‘Class 3’ (consisting of directionals) trigger potential lengthening. These are given in (47). Vowel-initial suffixes of this class do not.

  (47) ‘Class 3’ suffixes that cause vowel lengthening
  -faku ‘from uphill’
  -furuk ‘indoors’
  -kara ‘into the river’
  -kath ‘across’
  -kirih ‘into fire’
  -kiv ‘out through’
  -ku ‘onto’
  -kárh ‘into water’
  -mu ‘to’
  -path ‘around’
  -raa ‘hither’
  -ránnih ‘into’
  -rau ‘in’
  -rina ‘to here across’
  -rip ‘off, out’
  -ripaa ‘toward land’
  -ríshuk ‘out of’
  -rōovu ‘upriverward’
  -rūpa ‘out of one’s mouth’
  -rūprav ‘out through’
  -rūprih ‘in through’
  -rūprin ‘through’
  -rūpu ‘downriverward’
  -rūpuk ‘outdoors’
  -sip(riv) ‘up’
  -suru ‘off’
  -tunva ‘together’
  -vara ‘in through’
  -várayva ‘here and there indoors’

- Some, but not all consonant-initial suffixes belonging to Bright’s ‘Class 4’ (consisting mainly of valence-changing morphemes) trigger potential lengthening. These are given in (48). One vowel-initial suffix of this class also triggers potential lengthening, although most do not.

  (48) -mara ‘finish Xing’
  -math CAUSATIVE

Irregular vowel lengthening with derivational suffixes The following derivational suffixes trigger unusual potential lengthening in a preceding stem. These tend to fall further from the root than suffixes that trigger the regular pattern. Bright’s ‘Class 5’ and ‘Class 8’ each consist of a single vowel-initial suffix, neither of which trigger vowel lengthening.
• **-ihi** **BENEFACTIVE** (in Bright’s ‘Class 4’) is vowel initial, but triggers potential lengthening. It has the expected accentual effect.

• **-va** **PLURAL ACTION** can occur inside or outside of other derivative suffixes. When attached directly to a verb root, it triggers potential lengthening if the root contains only short vowels, and it has the expected accentual effect. When **-va** **PLURAL ACTION** follows other derivative suffixes, it triggers potential lengthening only in certain preceding suffixes. Following other derivative suffixes, it also has a vowel shortening effect mentioned above, and has unusual accentual effects.

• **-vınaa ~ vınaa** **PLURAL** (a post-consonantal allomorph of -nāa which probably historically contains -va; these are the only members of Bright’s ‘Class 6’) triggers potential lengthening, and has irregular accentual effects.

• **-tih** **DURATIVE** (the only member of Bright’s ‘Class 7’) triggers potential lengthening and has a limited accentual effect similar to that of the other suffixes above but only applicable to a subset of stems with a certain syllabic structure and/or accentual type. Another irregularity peculiar to this suffix is found when it occurs with the suffix **-sip(riv)** ‘up (to height of man or less)’, which takes the shorter form at the end of a word, and the longer form when followed by a suffix. When **-tih** **DURATIVE** is added to **-sipriv**, **riv** remains but the vowel lengthening conditioned by **-tih** applies to the **sip** syllable (Bright 1957:103).

• **-ara** ‘having Xed’ (adjective-forming deverbative) is vowel initial, but triggers potential lengthening. It has the expected accentual effect. No other deverbative suffixes (which are both vowel- and consonant-initial) trigger this vowel lengthening process.

• The **-pu** allomorph only of the denominative suffix **-hi** (which takes this form when the **Iterative** is present in the same stem) triggers potential lengthening in verb stems formed from nouns. Both allomorphs have the same accentual effect, but only the **p**-initial form causes lengthening (Bright 1957:84-85). This is the only denominative suffix and, as noted above, no other nominal suffixes trigger this vowel lengthening process.

**Irregular vowel lengthening with inflectional verbal suffixes** The following vowel-initial suffixes are classed as inflectional, and fall outside the derivational suffixes. The other inflectional suffixes (mostly vowel-initial) do not trigger potential lengthening.

• **-at** **PAST** triggers potential lengthening and has the expected accentual effect when it directly follows a derived stem (without any other inflectional suffixes). If it follows one of the other inflectional suffixes, it does not trigger lengthening, and its accentual effect is limited to a certain accentual class of stems.

• **-i** **IMPERATIVE** cannot co-occur with any other inflectional suffixes. It triggers potential lengthening with the expected accentual effect but with what I term Type 2 accent behavior (i.e., resulting in circumflex accent on a long vowel). The only other process seen so far that causes this accentual behavior is vowel coalescence.

2.10 **Gemination and Degemination**

2.10.1 **Consonant length in Karuk**

Bright states that two degrees of consonant lengthening in Karuk are detectable in his consultants’ speech in the 1950s, but notes that younger speakers of that time often do not make any consonant lengthening.
length distinction. The lesser length is phonetically predictable, and is not written in Bright’s orthography. The longer length Bright considers phonemic, and is written as doubled consonants in his orthography. However, this gemination is considered phonemic only because these consonants contrast with those in a limited class of words which do not display gemination, and Bright suggests that gemination may have all been allophonic historically (Bright 1957:9). Whether or not we want to consider gemination phonemic, it is not clear that a greater lengthening in these consonants has anything to do with the phonemic status of the geminate. Harrington writes at least one, but not all, of Bright’s lesser lengths as geminate (e.g., following but not preceding a long accented vowel; cf. (49d) below). All degrees of consonant length seem to be conditioned by the accentual and syllabic structure of the word.

### 2.10.2 Phonologically conditioned gemination

The environments in which consonant lengthening occurs are given in (49) (‘double’ indicates Bright’s phonemic geminates; ‘long’ indicates Bright’s phonetically long consonants). The class of nongeminate consonants given in (50) are not ever lengthened in any position. These have been defined featturally as the natural class of non-nasal sonorants (Levi 2008). These rules apply to both roots and derived stems, but not across word boundaries.

(49) Positions for gemination

a. The medial c in any word with the syllabic shape: (C)V(C)C (double)

b. A c following a short accented vowel: V(C)V(C) (double)

c. A c following a short accented vowel, {h v r}, and a short vowel: V{h v r}C (long)

d. A c before or after a long accented vowel: CVC, VVC (long)

e. A c after a long vowel following an accented syllable: V(C)V(C), VCV(CV) (long)

(50) Nongeminable consonants

? h v r y

As can be seen by how these environments are characterized, consonant length is intimately linked to accent. This aspect of consonant length will not be discussed further here; the following discussion is limited to alternations between geminated and ungeminated consonants. Remaining agnostic about the relationship between the two consonant lengths for now, I follow Bright in using the term “gemination” to refer only to the “doubled” consonant of the type in (49a-49b).

**Exceptions** Certain morphemes contain normally geminable consonants which are exceptionally exempt from gemination. Bright writes these consonants with capital letters unless they are in a position where they would never be geminated. They fall into four main groups, with the nongeminating consonants underlined in examples: 1) certain loan words (e.g., apus ‘apple’, chikin ‘chicken’, takus ‘pelican’), 2) names which may also be loans, 3) certain words that fall into Bright’s class of grammatical adverbs, but which seem to have more function word properties than lexical ones (e.g., ata ‘maybe’, kipa ‘like’, chimi future/optative marker), and 4) the derivative suffixes listed in (51).

(51) -kipach ‘characterized by’

-ka kam ‘side’

-ka nish ‘like’

-ripaa ‘toward land’

---

11 One would expect the set of consonants in (49c) to match the set of nongeminable consonants. Further work remains to be done to ascertain whether ? and y are exceptions to the rule in (49c), or whether they happen not ever to occur in this position.
The affricate ch has irregular behavior with regard to gemination. It can only be geminated in position (49b) (Bright 1957:18), and only when it is medial in a morpheme; it will not geminate across a morpheme boundary (e.g., mu-3sPOSS + chás ‘younger brother’: [múťaas]). A ch that results from the combination of th + s is geminable, but a ch that results from diminutive consonant harmony operating on th is not. This is in contrast to geminable n that results from diminutive consonant harmony operating on nongeminable r (Bright 1957:51-52).

2.10.3 Gemination in monosyllabic stems

The initial consonant of a monosyllabic stem is geminated whenever it is preceded by a vowel-final morpheme in the same word. This process takes place in prefixation, compounding, and cliticization (with a few exceptions, described below). It also takes place across word boundaries. This gemination process affects not only strictly monosyllabic stems, but also the following cases (Bright 1957:38-39, 54):

- Disyllables containing the sequence ź{h v r}v
- Disyllables ending in v(v)Ca
- Suffixed derivatives of monosyllables or of these phonological equivalents of monosyllables

Note that the sequence in the first point above is exactly the same as the sequence in (49c). Elsewhere in Karuk, we have evidence for a vrv sequence acting as a single long vowel.

The second point above suggests that a final vowel in an open syllable is extrametrical in Karuk, which should come as no surprise since we know that these vowels tend to drop out in various contexts. There is also evidence from accentuation that these vowels are extrametrical.

Finally, the third point above is interesting because it shows that the rules of gemination for prefixation cannot refer only to phonological structure of the stem they attach to. They must either have access to the underlying structure of the root they attach to, even when it has been derived, a violation of bracket erasure conventions, or monosyllabic roots must have some morphological class feature which marks them as “monosyllabic” throughout their derivation.

Exceptions The irregular gemination behavior of ch extends to monosyllables, so a monosyllabic stem beginning with ch will not geminate.

In compounds, gemination of a monosyllabic stem only takes place if it the final member of the compound. Gemination will not take place if the monosyllabic stem is in the first member of a compound which is subsequently prefixed, or if it is in the second member of a compound which is followed by another layer of compounding.

Some stems that are lexicalized synchronically, but based historically on a monosyllabic stem can pattern either as monosyllables or as polysyllables.

The behavior of monosyllables with proclitics has some additional limitations, described in the following section.

2.10.4 Gemination with proclitics

When ta=PERFECTIVE does not integrate with a glottal stop- or vowel-initial stem it precedes (as described in §2.4.3), it retains the form ta=. It does not trigger gemination in a following consonant,
even when it is accented in this form, meeting the criteria in (49b). Bright (1957:54) takes this lack of gemination (e.g., in t̀á ni’av ‘I have eaten’), as evidence that the types of gemination in (49) do not operate across word boundaries. Implicit in this statement is that he takes this phonological behavior as evidence for t̀á in this form as a separate word (along with accentual evidence). As expected, monosyllabic stem-initial gemination does occur following ta=; but only nominal stems are ever in a position for this to take place, since a verbal stem following ta= would always be prefixed.

After pa= DETERMINER, a following consonant will not be geminated (unless it is part of a monosyllabic stem, as described above), even if the resultant form fulfills the requirements for gemination in (49). Stem-initial monosyllable gemination is expected across word boundaries while other gemination is not, so this pattern makes sense if this proclitic is considered a separate word. This shows that while the combination of pa= DETERMINER with a noun acts as a single phonological word with regard to accent, the domain for gemination must be different.

Similarly, after pa= NOMINALIZER, a following consonant will also only be geminated if it is part of a monosyllabic stem, but even then only in certain cases. With this proclitic, gemination of the initial consonant of a monosyllabic stem occurs only if the stem (without pa=) would be unaccented in the utterance (regardless of its underlying accent). If it would be accented in the utterance (without pa=), regardless of its underlying accent, no gemination occurs. This makes sense accentually, because in the cases where gemination occurs, pa= becomes accented, creating the condition in (49b), and in the case where gemination does not occur, accent remains on the monosyllabic stem. Yet stem-initial monosyllable gemination is normally not limited to the environments for gemination in (49). Again, the lack of gemination in non-monosyllabic stems makes it seem like this pa= should also be considered a separate word.

Bright states that no monosyllabic stem-initial gemination occurs with pu= NEGATION, based on the example pukàra ‘nobody’ (Bright 1957:54). Yet we can see elsewhere that gemination takes place in pûffaat ‘nothing’ (Bright 1957:137), which matches several of the conditions for gemination. No other examples of accented pu= followed by a geminable consonant have been found. Gemination does not take place in pûfaat-hàra ‘nothing’ (WB_KL-08:22) or in pûkàan ‘not there’ (WB_KL-69:23), so the regular monosyllabic stem-initial gemination does not seem to apply. Gemination also does not take place when pu= attaches to an inflected monosyllabic verb stem with a zero allomorph of the person marker. Based on these few examples, it seems that pu= may actually follow the pattern described for pa= NOMINALIZER, above, but more data is needed to determine if this is actually the case.

2.10.5 Degemination across morpheme and word boundaries

When identical consonants become adjacent across a morpheme or word boundary, degemination occurs, reducing the sequence to a singleton consonant. This occurs in prefixing, suffixing, and compounding, as well as between words (presumably within an intonational grouping, and not across a pause).

In addition, when t and ch come together, in that order, across a morpheme or word boundary, the sequence is reduced to ch. Here we can see the stop closure portion of the affricate behaving independently from the fricative portion, as identical to a preceding t.

Exempt from degemination is a sequence of identical nasal consonants created by the rule discussed above in (2.2.2) which nasalizes oral sonorants when followed by the corresponding nasal across a word boundary. This exception could be explained in a rule ordering account by ordering degemination before nasalization.

Degemination would not be so surprising if it only applied in situations where the conditions for gemination would not hold. In this case, geminate consonants would simply never be allowed in the language, except in the prosodically strong positions defined in (49). However, the reality is more complicated than this. When degemination operates across word boundaries, it can occur
between two accented syllables in a row. Worse, it also appears to operate within a word matching the prosodic environment for gemination in (49), as seen in (52).

(52) *ithárar* ‘stranger’ + -*rii* ‘place’ → *[ith?aráːn]-i* ‘among strangers’ (Bright 1957:39)

2.11 Haplology and irregular contractions

2.11.1 Haplology

**General haplology** Haplology occurs occasionally and sporadically to simplify a sequence of two identical syllables that come together at a morpheme boundary to one (Bright 1957:35). There are also a few specific morphological combinations in which haplology is regular and obligatory.

**Haplology with *ahi*** When the suffixal -ahi component of the “modal”12 circumfix is added to a stem that has a final a(a)hi sequence, haplology is obligatory to reduce the resulting (a)ahahi sequence to a single (a)ahi (Bright 1957:89). Alternatively, one could say that the entire suffix is suppressed.

Another homophonous suffix, -ahi *essive*, exists in Karuk. Although this suffix displays suppletive allomorphy after stems ending in ih, Bright makes no mention of whether it participates in the same haplology that the modal -ahi does. The example given for modal -ahi haplology (*ikyáhí* ‘to be made’) seems, in fact, to contain the essive -ahi. Bright does not make clear what position class the modal -ahi suffix occupies in the verb stem, but if it always occurs outside of the essive -ahi, it is possible that the primary environment for this haplology to operate in is following essive -ahi. It may be that essive -ahi never is in position to follow a homophonous sequence.

**Haplology with *pa*** When pa= =nominalizer is added to a word with pa= =determiner, only one pa surfaces. Bright (1957:122) states that the determiner pa= is the one which remains. However, based on textual examples, it appears that at least some of the time, it is the nominalizer pa= that is retained. In many instances, it is ambiguous which pa= is present because the phonological effects of either would the same in the context, but based on differences in glottal stop loss and vowel coalescence triggered by the two (§2.4.3), it is possible to tell them apart with certain vowel-initial stems. Using this evidence, we can see that in the example in (53) the determiner pa= is present, while in the examples in (54) it must be the nominalizer pa=.

(53) *xíːs kunpíːp pa*’avansúxiič káaan tá kun ’ihmahaak ik kári kúpéethkeevish ‘And they said, “When the boys dance to there, you people must pull them out.”’

Source: Julia Starritt, text “Coyote Goes to the Sky” (WB_KL-08)

(54) a. *víːri payéem panipimúsahaak víːri vaa ník kári nimáheesh peekrívvaam káaan víra u’iigráhaak*

‘Now when I go back to see (my father), then I’ll see if the house is standing there.’

Source: Julia Starritt, text “Coyote Marries His Own Daughter” (WB_KL-16)

b. *vaa kumuíuk kunúuviitthíheesh peeshyáaat, peethívtháaneen tá kunpiyáahaaak*

‘They will clean the spring salmon with that, when they fix the world.’

Source: Mamie Offield, text “Coyote Gives Salmon and Acorns to Mankind” (WB_KL-17)

**Haplology with *ha*** When -aheen *anterior* tense marker follows a stem ending in h(a), the sequence haheen is reduced to heen. Similarly, when -ahaak *irrealis* follows a stem ending in h(a), the sequence hakaak is reduced to haak. These could alternatively be considered cases of irregular deletion, rather than haplology.

12The meaning is not modal in the sense of modality, but ‘to X in some way’.
2.11.2 Irregular segment deletion

In a few specific combinations of morphemes, consonants are lost irregularly, often resulting in vowel coalescence and irregular accentuation. In some cases, this shortening is optional, in others it is obligatory (Bright 1957:35-36). Some examples are given in (55).

(55) a. áas ‘water’ + ahóokira ‘place for going’ → asóokira ‘flume’
    b. asiktáaan ∼ asiktáan ‘woman’
    c. yúruk ‘downriver’ + va’áraara ‘its person’ → yurúkvaarara ‘Yurok Indian’
    d. káakam ∼ káam ‘upriver’ (and similarly for four other directional adverbs with -kam ‘side’)
    e. -ishrih ∼ -ish ‘down’ (see Bright 1957:97)
    f. -rih ‘place’ + -ich DIMINUTIVE → -nihich ∼ -niich
    g. -síiprina ∼ -síip ‘up (PLURAL ACTION)’

Stem-final aha sequences (in which the final a is a non-deleting a) can be reduced to a in fast speech (Bright 1957:43). This can occur both at the end of a word and within a word, as in (56).

(56) a. íshaha ∼ ísha ‘water’
    b. isháéektaamnam ∼ ishéektaamnam ‘water bucket’

2.11.3 Shortened allomorphs of certain affixes

A few Karuk affixes have two allomorphs, a longer and a shorter one. Depending on the morpheme, the choice between the two can be morphologically or lexically determined, or apparently in free variation.

One pattern seen in suffixes of this type is that the shorter allomorph is used word-finally, and the longer one is used word-medially. Based on the extremely common phenomenon of devoicing and whispering final syllables of Karuk words, it may be that this phonetic tendency has been phonologized as a (mostly) regular alternation in these morphemes. The longer allomorph must be used when additional suffixal material follows, but may also be optionally used in word-final position. These shortening verbal suffixes are listed in (57).

(57) a. -ish ∼ -ishrih- ‘down’, RESULTATIVE
    b. -sip ∼ -síip- ‘up’, INITIATIVE

The nominal suffix -sa ∼ -sas PLURAL follows almost the opposite pattern: the vowel-final form is used before other suffixes, while the two variants are in free variation at the end of words, with the vowel-final form being the more common. This suffix takes a special allomorph, -iivsha(s), with possessed kinship terms (Bright 1957:81).

The presence of a second syllable in a nominal suffix, -hich ∼ -hichva ‘imitation, make-believe’ is not morphologically dependent, but varies by idolect (Bright 1957:71).

The impersonal possessive prefix kuma- → ku- when used combination with a set group of adverbs, without an antecedent (Bright 1957:57).

The nominal suffix -kam ∼ -kúkam, loosely ‘side’, forms adverbs from nouns and adverbs. The two allomorphs are in free variation, with the shorter allomorph being more common (Bright 1957:79).

2.12 Suppletive and other unusual allomorphy

2.12.1 Blocking

Verbal plural An affix used to mark plurality of (animate) subjects on intransitive verbs or objects on transitive verbs has three allomorphs. The choice between the two suffixal allomorphs,
-naa and -vˇinaa~vˇinaa is phonologically conditioned; the prefixal allomorph iru- is morphologically conditioned.

The suffixal PLURAL allomorphs, which comprise Bright’s ‘Class 6’, cannot co-occur in the same stem with a suffix of ‘Class 2’ or ‘Class 3’ (positionals and directionals). When one of these suffixes is present, the plural morpheme is instead expressed by the prefix iru-.

Neither of the suffixal allomorphs -naa and -vˇunaa∼vˇanaa is phonologically conditioned; the prefixal allomorph iru- is morphologically conditioned. The suffixal plural allomorphs, which comprise Bright’s ‘Class 6’, cannot co-occur in the same stem with a suffix of ‘Class 2’ or ‘Class 3’ (positionals and directionals). When one of these suffixes is present, the plural morpheme is instead expressed by the prefix iru-.

TAM suffixes  The verbal negative suffix -ara normally co-occurs with the negative proclitic pu=. It falls at the rightmost edge of the verb stem. However, -ara NEGATIVE does not appear when any of the following suffixes/enclitics are present:

- ap INVERSE/NEG
- at PAST
- aheen ANTERIOR
- anik ANCIENT
- apaak IRREALIS
- irak ‘where’
- i IMPERATIVE
- =xay VETATIVE

These are all part of the TAM class of suffixes which fall at the right edge of the verb stem. Nonetheless, -ara NEGATIVE is found outside of -avish FUTURE, which also makes up part of this class. It also is found outside of -tih DURATIVE (which Bright places with the inner derivational suffixes). The only other suffix classed with the outer TAM suffixes is -(h)an PARTICIPIAL. Bright does not rule out -ara NEGATIVE in combination with this suffix, but there are no examples of the two co-occurring.

2.12.2 Lexically and otherwise conditioned phenomena

Diminutive  The nominal diminutive has several morphs which are conditioned in various ways. The -ich allomorph is most commonly used and is the elsewhere case. The use of the allomorph -ach seems to be somewhat phonologically conditioned by vowel harmony and tends to be used with stems ending in a or that contain an a. However, the pattern is irregular; -ach is also sporadically used with other stems and not all a-final stems take -ach.

The allomorph -iich is lexically conditioned by a few stems. Bright considers the diminutive suffix -ish a distinct morpheme from -ich because the two can co-occur ( -ish always precedes -ich), with a specific meaning ‘more, rather’. It is rare compared to -ich, but can also occur alone, generally with non-transparent meanings. Two copies of -ich can also occur in sequence, when the first has been lexicalized as part of a stem (Bright 1957:76-79).

Past markers with pa=  The free morphemes ip NEAR PAST and mit REMOTE PAST have special allomorphs when appearing with the proclitic pa= NOMINALIZER, as well as portmanteau forms for the combination, as follows:

- ip → ipa / pa=_; ipa alone can replace pa= + ipa.
- mit → mita / pa=_; mita alone can replace pa= + mita

Participial  The -(h)an PARTICIPIAL suffix is added to verb stems to form participles, i.e., ‘the one that Xs’. When one of the past markers mit(a) or ip(a) (free morphemes which precede the predicate) is present, the participial suffix is accompanied by the prefix ku- on the verb stem.
2.12.3 Allomorphy with Plural Action

A sizeable number of the morphologically conditioned phonological processes in Karuk are triggered by the presence of the verbal suffix -va PLURAL ACTION. Some of these, which relate to more general processes, have already been discussed above.

Allomorphs of -va  The suffix -va PLURAL ACTION itself appears in the form -na when following certain suffixes. All these suffixes belong to Bright’s ‘Class 3’; there are quite a few other suffixes in this class which do not trigger the change. The suffixes that condition the appearance of the -na allomorph are given in (58). If the suffix is listed alone, this indicates that the suffix combines with -na as given. If the PLURAL ACTION suffix additionally conditions a change in first suffix, the combination is given as well.

(58) Suffixes that trigger va → -na
- kiv ‘out through tubular space’ + -va → -kiina
- raa ‘hither’
- rina ‘hither across water’ + -va → -riina
- rípaa ‘toward land’ + -va → -ripana
- róovu ‘hence upriverward’ + -va → -roona
- rípaa ‘out of ones mouth’ + -va → -ripana
- sip(ri) ‘up (to height of man or less)’ + -va → -siiprina
- uraa ‘up (to considerable height)’ + -va → -úraana
- vraa ‘over’
- (v)vrin ‘in opposite directions’ + -va → -(V)vriina

As noted above in §2.5.3, the final a of va- becomes u preceding -tih DURATIVE and (for most speakers) -naa PLURAL.

Allomorphs conditioned by -va  A number verbal suffixes have irregular allomorphs which occur only when -va is added outside of them. These suffixes all belong to Bright’s ‘Class 3’, except -uk ‘hither’ and -kiri INSTRUMENTAL, which are part of ‘Class 4’. These suffixes are given in (59), along with the combination.

(59) Suffixes with special allomorphs in combination with va
a. Vowel lengthening
- path ‘around in a circle’ + -va → -paathva
- ránnih ‘in(to) a container’ + -va → -ránnihva
- rip ‘off, out’ + -va → -riipva
- rúprih ‘in through a solid’ + -va → -rúuprihva
- uniih ‘down (from considerable height)’ + -va → -úuniihva
- (V)vruk ‘down over the edge of something’ + -va → -(V)vrukva
- uk ‘hither’ + -va → -uuka
b. Vowel lengthening and nasalization
- kara ‘towards center of body of water’ + -va → -kaana
- kiv ‘out through tubular space’ + -va → -kiina
- rina ‘hither across water’ + -va → -riina
- róovu ‘hence upriverward’ + -va → -roona
-s≤p(riv) ‘up (to height of man or less)’ + -va → -s≤iprina
-uraa ‘up (to considerable height)’ + -va → -uraana
-(V)ervin ‘in opposite directions’ + -va → -(V)ervina
-kiri INSTRUMENTAL + -va → -kiiinva

c. Nasalization
-furuk ‘indoors’ + -va → -f≤unukva
d. No vowel coalescence
-faku ‘hither from uphill’ + -va → -f≤akva
e. Vowel shortening and geminability
-≤ipaa ‘toward land’ + -va → -≤ipana (with geminable p)
-≤ipaa ‘out of one’s mouth’ + -va → -≤ipana (with geminable p)
-≤ipuk ‘outdoors’ + -va → -≤ipukva (with geminable p)

The irregular allomorphy triggered by -va can be sorted into a few general types of effects: vowel lengthening, nasalization, lack of vowel coalescence, vowel shortening, and geminability. The suffixes shown in (59a) display vowel lengthening. Those in (59b) show both vowel lengthening in the first suffix and nasalization either in the first suffix or in -va. The suffix in (59c) shows irregular nasalization without vowel lengthening. The suffix in (59d) loses a final vowel, where the expected pattern would be for the v of -va to drop out, resulting in vowel coalescence between the two suffixes (this does occur with va in combination with other suffixes). Finally, the suffixes in (59e) display vowel shortening (where applicable), and the medial consonant of the first suffix, which is normally non-geminant, becomes geminable.

Suppletive allomorphy with -va In addition to the above changes, va PLURAL ACTION triggers a suppletive allomorph of one directional suffix: -thuna ‘around’ becomes -piith when followed by -va PLURAL ACTION.

2.12.4 Other morphologically conditioned allomorphy

Suppletive allomorphy with iterative All allomorphs of the iterative prefix condition long distance changes in certain suffixes present in the same stem. If -hi DENOMINATIVE or -ahi ESsIVE (which likely contains the denominative, historically) are present in the same stem as the iterative, they surface as -pu and -apu, respectively (Bright 1957:85, 112). The suffix -ahi MODAL, homophonous with the essive, on the other hand, does not make a similar change in form when the iterative is present.

When the iterative prefix is present on the same stem, the suffix -paath ‘around in a circle’ followed by -va PLURAL ACTION becomes -iroopith-va. (Without the iterative present, the combination is -paath-va. Without the plural action present, the iterative does not condition a special allomorph of -paath.)

Suppletive allomorphy of essive The verbal suffix -ahi ESsIVE becomes -va when attached to a stem ending in the sequence -ih, with the following exception. When the sequence that triggers this allomorphy is followed by -tih DURATIVE, the essive remains in its elsewhere form, -ahi (Bright 1957:111). Thus, while the sequence ihva is preferable to ihahi, the sequence ihahitih appears to be preferable to ihvatih.

Consonant changes with ‘down’/RESULTATIVE The verbal suffix -ish(rih) ‘down’, RESULTATIVE triggers irregular consonantal changes in certain stems preceding it:

-path ‘throw’ + -ish(rih) → -páchish(rih)
-ásiw ‘sleep’ + -ISH(rih) → -áasiSH(rih)

These changes are reminiscent of diminutive consonant harmony, but there is no evidence for the presence of a diminutive morpheme in these combinations.

**Vowel lengthening in ‘to, at, about’** The verbal suffix -ISH(rih) ‘to, at, about’ undergoes vowel lengthening to -úúnISH(rih) when it follows the -Hí DENOMINATIVE suffix.

### 2.12.5 Phonologically conditioned allomorphy

**Iterative allomorphy** The verbal iterative prefix ip- has four allomorphs that are clearly phonologically related, given in (60). The choice of allomorph is phonologically conditioned, but not well-motivated by cross-linguistic phonological constraints.

\[
\begin{align*}
(60) & \rightarrow pa- /_/ic [+labial], xv; (i \rightarrow \emptyset) \\
& \rightarrow p- /_/ (??) v; (?? \rightarrow \emptyset) \\
& \rightarrow pi- /_/ pi \\
& \rightarrow ip- elsewhere
\end{align*}
\]

When the iterative is attached to a stem beginning with i followed by a labial consonant (p, f, v, m) or the sequence xv, the i is deleted and the allomorph pa- is used. When it is attached to any other vowel- or glottal stop-initial stem, the glottal stop is deleted, and the allomorph p- is used. If the stem begins in p-, the allomorph pi- is used. Before consonants other than p or ?, the allomorph ip- is used.

**2pl person marker kii(k)- allomorphy** The verbal person marking prefix used for a 2pl subject in the optative and a 2pl object in the positive has two allomorphs, kii- and kiik-. Unexpectedly, the kiik- allomorph is used before a consonant-initial stem, while the kii- allomorph is used before a vowel-initial stem.

**Imperative allomorphy** The IMPERATIVE has three distinct phonologically conditioned allomorphs, given in (61).

\[
\begin{align*}
(61) & \rightarrow [+nasal] / \{v, r(v)\} _-
\\
& \rightarrow \emptyset- / vv
\\
& \rightarrow -i elsewhere
\end{align*}
\]

When the stem ends in a v or r, the imperative is expressed as nasalization of this consonant, to m and n, respectively. In a stem ending in r followed by a short vowel, the vowel is deleted and the r is nasalized in the imperative form. The imperative is not overtly expressed on stems ending in long vowels. The imperative takes the form of the suffix -i elsewhere (Bright 1957:65-66).

**Emphatic allomorphy** An emphatic suffix added to pronouns (giving the reading ‘I myself’, e.g.) has the allomorph -paan following consonants and -mpaan following vowels.

**Suppletive allomorphy in verbal plural** As discussed in (2.12.1), the verbal plural morpheme has various allomorphs. Following a vowel in the preconsonantal alternant of the stem (i.e., vowels which drop out before a vowel or word-finally count), the suffixal allomorph -naa is used. Following a consonant in the preconsonantal alternant of the stem, -vúnaa (or -vánna in some idiolects) is used. As Bright notes, -vúnaa~vánna is probably historically a combination of plural action -va and plural -núaa, but is not synchronically decomposable (Bright 1957:112).
Perfective allomorphy  The perfective $t\alpha=$ takes different forms depending on the syllable structure of the stem it precedes. Before a predicate beginning with a glottal stop and a short vowel in an open syllable, the glottal stop is deleted and the allomorph $t$- is used. Before a predicate beginning with a glottal stop and a short vowel in a closed syllable, the glottal stop is deleted and the allomorph $t\acute{a}$- is used, which coalesces with the following vowel. Before a predicate beginning with a consonant other than a glottal stop, $t\acute{a}$ is used (Bright 1957:139).

\begin{align*}
(62) & \rightarrow t\ -/ (\bar{?)}\text{cvv}(v); (\bar{?} \rightarrow \emptyset) \\
& \rightarrow t\acute{a}\ -/ (\bar{?)}\text{ccv}; (\bar{?} \rightarrow \emptyset) \\
& \rightarrow t\acute{a}\ - \text{elsewhere}
\end{align*}

Vowel length dependent on stem syllable structure  A few of the directional verbal suffixes have variable vowel length, conditioned by the syllable structure of the stem they attach to, as follows:

- The verbal suffix -ish(rih) becomes -i\text{\textbar}ish(rih) when attaching to a stem ending in VVCC or CCV.
- The verbal suffix -raam ‘place of Xing’ (an adjective-forming deverbative) becomes -ram when attaching to a stem ending in VVCC, CCV, or VHv.
- The verbal suffix -ku ‘onto’ becomes -k\text{\textbar}a when attaching to stems of the form C\text{\textbar}VV(c) and C\text{\textbar}CV(c).

2.13 Discussion

At the conclusion of this litany of disparate and exception-ridden phonological patterns, one wonders if there are any overarching principles driving the various alternations to be found. If we broaden our focus, we can begin to see that, indeed, a great number of the patterns can be organized into just a few categories of motivations, which are not at all exotic. These are, preliminarily:

- Vowel hiatus avoidance
- Consonant cluster avoidance
- Avoidance of sequences of identical or near-identical syllables
- Consonant harmony of various sorts
- Relating to weak vowels and weak positions (e.g., morpheme-final vowels, alternations involving $h$)
- Syllable structure constraint and/or metrically driven (e.g., glottal stops and some glides)
- Metrical and/or tone-driven (e.g., vowel length, consonant length)

Some further generalizations can be made. Verbs and nouns act differently from each other in many respects. Additional work is required before a full accounting of processes seen in verbal suffixes will be possible, but it does seem that many phonological properties of suffixes can be organized into two groupings, which may match up with inflection and derivation. Suffixing in general has a relationship to word-final processes and can also be sensitive to stem shape.

There is a tight relationship between prefixing and compounding, which share many phonological properties. Compounding also shares properties with classifiers and so-called postpounds. Prefixing and compounding also share properties with proclitics. Proclitics seem to behave differently from both prefixes and separate words, and also rather differently from each other. Not surprisingly, prefixing, compounding, and proclitics all relate to word-initial processes.
There is also clearly a defineable set of postlexical processes which are similar to, but often slightly different from related lexical processes.

Of course, we are also left with some perplexing morphologically driven alternations, such as the long-distance suffixal allomorphy triggered by the iterative prefix, and the prefixal verbal plural which appears when the verbal plural suffix is blocked by a large class of directional suffixes, which pose interesting challenges to models of morphological interaction.

3 Verbal Affix Combinations

Bright (1957) divides verbal suffixes into twelve classes, eight derivational and four inflectional (a schema of these is provided in Appendix A). Suffixes were divided into classes partly based on position but also partly based on semantics. Further, Bright notes instances when certain suffixes within a class can co-occur. In order to gain a better understanding of affix ordering and combinatoric possibilities in Karuk, a corpus study of verbal affix pairings was undertaken.

3.1 Methodology

Bigram affix data was collected from a morphologically parsed corpus of 91 Karuk texts and the online Karuk dictionary. For each affix, all the example sentences containing that affix were extracted from the text corpus. Example sentence lists were compiled for each affix, and sorted by co-occurring affix pairs. The frequency of each pair’s occurrence in the corpus was tallied.

Words included in the lexicon as entries range from highly lexicalized and opaque to items that transparently include productive morphology (but warranted a dictionary entry for one reason or another). Notes about etymologies of lexical entries containing reference to multiple morphemes were extracted from the lexicon text file. Etymologies that were plausible though not entirely certain were included. Pairs of verbal affixes from these notes were compiled and tallied.

3.2 Text Corpus Results

3.2.1 Prefixal Material

From the text corpus, the following generalizations can be made:

- person/number marking precedes prefixes *iru*-PLURAL (*n*=1), *ip*-ITERATIVE (*n*=118), and *kupa*-MODAL (*n*=19).
- *kupa*-MODAL precedes *ip*-ITERATIVE (*n*=2). Ordering of *iru*-PLURAL relative to prefixes other than person/number is not known.
- *pa*= NOMINALIZER, *ta*= PERFECTIVE, and *pu*= NEGATIVE may all have material intervene between them and an inflected verb stem, and can occur without an inflected verb. When adjacent to an inflected verb stem, they can undergo phonological fusion with the stem and form a single prosodic word with it.
- *pa*= NOMINALIZER, *ta*= PERFECTIVE (*n*=802), and *pu*= NEGATIVE (*n*=36) all precede the person/number prefix when present (certain person/numbers are realized as ∅ when *pu*= is present).
- When they co-occur with the negator *pu=*, *pa*= (*n*=3) and *ta*= (*n*=4) precede *pu*=.

---

13 Co-occurrence of person marking prefixes and nominalizer *pa=* were not counted because this proclitic is known to fall at the leftmost edge of verbal prefixes and enclitics.

14 One counterexample is found, in which *pu=* precedes *ta=* This example is from a recent elicited sentence and could represent speaker error or actual variation. The other examples are from texts. Bright (1957:138) states that *pu=* does not attach to *pa=* or *ta=*.
• When they co-occur, pa= precedes ta= (n=44).

• Other prefixes/proclitics noted in Bright (1957) are ku- PAST PARTICIPIAL, and c= ANTICIPATIVE. Ordering facts could not be determined because no textual examples have been found.

This gives us the schematic representation of preverbal material in (63):

(63) \[ pa= ... \text{ ta= } ... \text{ pu= } ... \text{ PERSON/NUMBER } - \text{kupa } - \text{ip } - \text{VERB ROOT} \]

\[ - \text{iru } - \]

### 3.2.2 Suffixal Material

**Pairs of suffixes** The following pairs of suffixes were found in the text corpus. Suffixes are listed in the order attested, with the number of tokens found following each pair. In the rare cases where multiple orders were attested, the pairs are marked with a ‘*’.

(64) Pairs of inner suffixes occurring together:

-\[ -\text{thuna 'around'} \quad -\text{ish(rih) 'down'} \quad (n=1) \]
-\[ -\text{ish(rih) 'down'} \quad -\text{taku 'on top of'} \quad (n=1) \]
-\[ -\text{ar 'to go in order to'} \quad -\text{koo 'to'} \quad (n=2) \]
-\[ -\text{ar 'to go in order to'} \quad -\text{uk 'hither'} \quad (n=1) \]

(65) Pairs of inner suffixes and -ahi ESSIVE:

-\[ -\text{unih 'down'} \quad -\text{ahi ESSIVE} \quad (n=2) \]
-\[ -\text{varayva 'here and there'} \quad -\text{ahi ESSIVE} \quad (n=1) \]
-\[ -\text{ramnih 'into'} \quad -\text{ahi ESSIVE} \quad (n=1) \]
-\[ -\text{rip(riv) 'up'} \quad -\text{ahi ESSIVE} \quad (n=1) \]
-\[ -\text{ar 'to go in order to'} \quad -\text{ahi ESSIVE} \quad (n=1) \]
-\[ -\text{ara 'having been'} \quad -\text{ahi ESSIVE} \quad (n=1) \]

(66) Pairs of inner suffixes and -va PLURAL ACTION:

-\[ -\text{ramnih 'into'} \quad -\text{va PLURAL ACTION} \quad (n=1) \]
-\[ -\text{suru 'off'} \quad -\text{va PLURAL ACTION} \quad (n=1) \]
-\[ -\text{ish(rih) 'down'} \quad -\text{va PLURAL ACTION} \quad (n=1) \]
-\[ -\text{unih 'down'} \quad -\text{va PLURAL ACTION} \quad (n=2) \]
-\[ -\text{uraa 'down'} \quad -\text{va PLURAL ACTION} \quad (n=2) \]
-\[ -\text{kurih 'into water'} \quad -\text{va PLURAL ACTION} \quad (n=1) \]
-\[ -\text{roovu 'upriver'} \quad -\text{va PLURAL ACTION} \quad (n=3) \]
-\[ -\text{mu 'to'} \quad -\text{va PLURAL ACTION} \quad (n=2) \]
-\[ -\text{ar 'to go in order to'} \quad -\text{va PLURAL ACTION} \quad (n=2) \]

(67) Pairs of inner suffixes and -tih DURATIVE:

-\[ -\text{sip(riv) 'up'} \quad -\text{tih DURATIVE} \quad (n=2) \]
-\[ -\text{mu 'to'} \quad -\text{tih DURATIVE} \quad (n=3) \]
-\[ -\text{koo 'to'} \quad -\text{tih DURATIVE} \quad (n=2) \]
-\[ -\text{ish(rih) 'down'} \quad -\text{tih DURATIVE} \quad (n=1) \]
-\[ -\text{ahi MODAL} \quad -\text{tih DURATIVE} \quad (n=9) \]
-\[ -\text{ara 'having been'} \quad -\text{tih DURATIVE} \quad (n=1) \]
(68) Pairs of inner suffixes and -ach DIMINUTIVE:

-**ish(rih) ‘down’ -ach DIMINUTIVE (n=1)**

(69) Pairs of middle position suffixes occurring together:

<table>
<thead>
<tr>
<th>Suffix 1</th>
<th>Suffix 2</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ahi ESSIVE</td>
<td>-tih DURATIVE</td>
<td>(n=45)</td>
</tr>
<tr>
<td>-va PLURAL ACTION</td>
<td>-ahi ESSIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-va PLURAL ACTION*</td>
<td>-tih DURATIVE*</td>
<td>(n=12)</td>
</tr>
<tr>
<td>-tih DURATIVE*</td>
<td>-va PLURAL ACTION*</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-(vu)naa PLURAL</td>
<td>-tih DURATIVE</td>
<td>(n=17)</td>
</tr>
</tbody>
</table>

(70) Pairs of -tih DURATIVE with outer suffixes:

<table>
<thead>
<tr>
<th>Suffix 1</th>
<th>Suffix 2</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>-tih DURATIVE*</td>
<td>-at PAST*</td>
<td>(n=7)</td>
</tr>
<tr>
<td>-at PAST*</td>
<td>-tih DURATIVE*</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-tih DURATIVE</td>
<td>-ap INVERSE/NEG</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-tih DURATIVE</td>
<td>-(h)an PARTICIPIAL</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-tih DURATIVE</td>
<td>-ara NEGATIVE</td>
<td>(n=37)</td>
</tr>
<tr>
<td>-tih DURATIVE</td>
<td>-ahaak IRREALIS</td>
<td>(n=4)</td>
</tr>
<tr>
<td>-tih DURATIVE</td>
<td>-irak ‘where’</td>
<td>(n=4)</td>
</tr>
<tr>
<td>-tih DURATIVE</td>
<td>-anik ANCIENT</td>
<td>(n=5)</td>
</tr>
<tr>
<td>-tih DURATIVE</td>
<td>-avish FUTURE</td>
<td>(n=26)</td>
</tr>
</tbody>
</table>

(71) Pairs of other middle position suffixes with outer suffixes:

<table>
<thead>
<tr>
<th>Suffix 1</th>
<th>Suffix 2</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ach DIMINUTIVE</td>
<td>-i IMPERATIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-va PLURAL ACTION</td>
<td>-i IMPERATIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-va PLURAL ACTION</td>
<td>-raam ‘place’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-va PLURAL ACTION</td>
<td>-aheen ANTERIOR</td>
<td>(n=4)</td>
</tr>
<tr>
<td>-va PLURAL ACTION</td>
<td>-anik ANCIENT</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-va PLURAL ACTION</td>
<td>-avish FUTURE</td>
<td>(n=3)</td>
</tr>
<tr>
<td>-(vu)naa PLURAL</td>
<td>-avish FUTURE</td>
<td>(n=1)</td>
</tr>
</tbody>
</table>

(72) Pairs of inner suffixes and outer suffixes:

<table>
<thead>
<tr>
<th>Suffix 1</th>
<th>Suffix 2</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>-kurih ‘into water’</td>
<td>-avish FUTURE</td>
<td>(n=3)</td>
</tr>
<tr>
<td>-sip(riv) ‘up’</td>
<td>-avish FUTURE</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-ahi MODAL</td>
<td>-avish FUTURE</td>
<td>(n=6)</td>
</tr>
<tr>
<td>-uraa ‘up’</td>
<td>-aheen ANTERIOR</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-rraa ‘hither’</td>
<td>-aheen ANTERIOR</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-vraqh ‘into a sweathouse’</td>
<td>-aheen ANTERIOR</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-mu ‘to’</td>
<td>-ahaak IRREALIS</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-vruk ‘down over’</td>
<td>-ahaak IRREALIS</td>
<td>(n=1)</td>
</tr>
</tbody>
</table>

(73) Pairs of outer suffixes occurring together:

<table>
<thead>
<tr>
<th>Suffix 1</th>
<th>Suffix 2</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>-avish FUTURE</td>
<td>-(h)an PARTICIPIAL</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-avish FUTURE</td>
<td>-ap INVERSE/NEG</td>
<td>(n=7)</td>
</tr>
<tr>
<td>-avish FUTURE</td>
<td>-ara NEGATIVE</td>
<td>(n=20)</td>
</tr>
</tbody>
</table>

39
The following suffixes did not occur in combination with any other productive suffixes in the text corpus (i.e., other than those in lexicalized forms). Verbal suffixes found attaching to a verb stem created by the -hi DENOMINATIVE suffix are included here.

(74) Suffixes occurring alone in textual examples:

- aan AGENTIVE                  - rishuk ‘out of’
- čep ‘refuse from Xing’         - rúprih ‘in through’
- faku ‘from uphill’            - rúpuk ‘outdoors’
- kara ‘into the river’         - ìwar ‘long time’
- mara ‘to finish Xing’          - oo HABITUAL
- rúshuk ‘out of’
- rúprih ‘in through’
- rúpuk ‘outdoors’
- ìwar ‘long time’

The following suffixes identified by Bright have not yet been found used productively in any text examples (i.e., other than in lexicalized forms):

(75) Suffixes without textual examples:

- a DEVERBATIVE                  - rav ‘in’
- ahiv ‘on an occasion’          - rih ‘up’
- apuh ‘having been Xed’         - rina ‘hither across’
- ara INSTRUMENTAL               - rip ‘off, out’
- chak ‘closing up’              - rípaa ‘toward land’
- eep ‘away from (a person)’     - riv ‘at rest’
- fíp ‘completely’               - rúpaa ‘out of one’s mouth’
- furu ‘into (?)’                - rúpaa ‘out of one’s mouth’
- fíp ‘in’                       - rúpaa ‘out of one’s mouth’
- furu ‘into (?)’                - rúpaa ‘out of one’s mouth’
-仪式 ‘indoors’                  - rúpaa ‘out of one’s mouth’
- iichva ‘in pretense’           - rúpaa ‘out of one’s mouth’
- ihi BENEFECTIVE                - sap ‘closing up’
- iroopith ‘around’              - sar ‘along with’
- iruw ‘too much’                - tánmah ‘for nothing’
- kath ‘across’                  - tarar ‘fastening’
- kirí INSTRUMENTAL              - tunva ‘together’
- kirí MOTION (?)                - umish ‘to, at, about’
- kirí ‘into fire’               - vara ‘in through’
- kirí ‘out through’             - varak ‘from upriver’
- ku ‘onto’                      - veena AGENTIVE
- math CAUSATIVE                 - vera ‘over’
- path ‘around’                  - erek ‘in response to motion’
- ram ‘in’ (DEVERBATIVE)         - erin ‘in opposite directions’

Ordering generalizations  The generalizations that can be made from the corpus data about suffix ordering are limited because the majority of individual suffixes occur with at most one other suffix in a pair. The template in Table [4] gives the confirmed ordering based on text examples.
Table 1: Suffix Template

<table>
<thead>
<tr>
<th>-thuna ‘around’</th>
<th>-ish(rih) ‘down’</th>
<th>-taku ‘on’</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ach DIM</td>
<td>-ach DIM</td>
<td>-heen ANT</td>
</tr>
<tr>
<td>-va PL.ACT</td>
<td>-va PL.ACT</td>
<td>-ruam ‘place’</td>
</tr>
<tr>
<td>-i IMP</td>
<td>-i MODAL</td>
<td>-va MODAL</td>
</tr>
<tr>
<td>-ahi ESS</td>
<td>-ahi ESS</td>
<td>-ahi MODAL</td>
</tr>
<tr>
<td>-tih DUR</td>
<td>-tih DUR</td>
<td>-tih DUR</td>
</tr>
<tr>
<td>-anik ANC</td>
<td>-anik ANC</td>
<td>-anik ANC</td>
</tr>
<tr>
<td>-irak ‘where’</td>
<td>-irak ‘where’</td>
<td>-irak ‘where’</td>
</tr>
<tr>
<td>-avish FUT</td>
<td>-avish FUT</td>
<td>-avish FUT</td>
</tr>
<tr>
<td>-(h)an PTCL</td>
<td>-(h)an PTCL</td>
<td>-(h)an PTCL</td>
</tr>
<tr>
<td>-ap INV</td>
<td>-ap INV</td>
<td>-ap INV</td>
</tr>
<tr>
<td>-ara NEG</td>
<td>-ara NEG</td>
<td>-ara NEG</td>
</tr>
<tr>
<td>-ramnih ‘into’</td>
<td>-ramnih ‘into’</td>
<td>-ramnih ‘into’</td>
</tr>
<tr>
<td>-suru ‘off’</td>
<td>-suru ‘off’</td>
<td>-suru ‘off’</td>
</tr>
<tr>
<td>-unih ‘down’</td>
<td>-unih ‘down’</td>
<td>-unih ‘down’</td>
</tr>
<tr>
<td>-kurih ‘into water’</td>
<td>-kurih ‘into water’</td>
<td>-kurih ‘into water’</td>
</tr>
<tr>
<td>-roovu ‘upriver’</td>
<td>-roovu ‘upriver’</td>
<td>-roovu ‘upriver’</td>
</tr>
<tr>
<td>-mu ‘to’</td>
<td>-mu ‘to’</td>
<td>-mu ‘to’</td>
</tr>
<tr>
<td>-ahi MODAL</td>
<td>-ahi MODAL</td>
<td>-ahi MODAL</td>
</tr>
<tr>
<td>-(vu)naa PL</td>
<td>-(vu)naa PL</td>
<td>-(vu)naa PL</td>
</tr>
<tr>
<td>-ar ‘go to’</td>
<td>-ar ‘go to’</td>
<td>-ar ‘go to’</td>
</tr>
<tr>
<td>-koo ‘to’</td>
<td>-koo ‘to’</td>
<td>-koo ‘to’</td>
</tr>
<tr>
<td>-uk ‘hither’</td>
<td>-uk ‘hither’</td>
<td>-uk ‘hither’</td>
</tr>
<tr>
<td>-unih ‘down’</td>
<td>-unih ‘down’</td>
<td>-unih ‘down’</td>
</tr>
<tr>
<td>-varaya ‘here and there’</td>
<td>-varaya ‘here and there’</td>
<td>-varaya ‘here and there’</td>
</tr>
<tr>
<td>-ara ‘been’</td>
<td>-ara ‘been’</td>
<td>-ara ‘been’</td>
</tr>
<tr>
<td>-sip(riv) ‘up’</td>
<td>-sip(riv) ‘up’</td>
<td>-sip(riv) ‘up’</td>
</tr>
<tr>
<td>-vruk ‘down over’</td>
<td>-vruk ‘down over’</td>
<td>-vruk ‘down over’</td>
</tr>
<tr>
<td>-raa ‘hither’</td>
<td>-raa ‘hither’</td>
<td>-raa ‘hither’</td>
</tr>
<tr>
<td>-vrah ‘into sweathouse’</td>
<td>-vrah ‘into sweathouse’</td>
<td>-vrah ‘into sweathouse’</td>
</tr>
</tbody>
</table>

3.2.3 Discussion

The positions shown in (63) and in Table 1 are consistent with the position classes in Bright (1957) (Appendix A). More data is needed to establish orderings between undetermined pairs of affixes in both prefixes and suffixes.

Two sets of affixes show variable ordering in this data: -tih DUR and -va PLURAL ACTION, and -tih DUR and -at PAST. Bright (1957:91) describes the plural action suffix as being able to be freely placed after any derivative suffixes, which appears to be borne out. It is rather unexpected to see it following -tih, though, because the durative seems to be on the borderline between derivation and inflection, and normally falls outside of the derivative suffixes. The unexpected example is shown in (76b), and an example of the more common order is given in (76a). The semantics and scope of -va are not well understood, so more research is needed to understand what determines its placement.

(76) a. xás pa’aantunvech kun’ivitshúrōoti víři vaa u’ifiktih
   xas pa-’aun -tunvech kun- ’ivit -suru -va -tih víři vaa u-
   then NOMZ-string -small(pl.) 3pl(>3s)-detach-off -PL.ACT -DUR SO SO 3s(>3)-
   -iflik -tih
   pick.up -DUR
'And when they picked off the little strings, he was picking them up.'
Source: Julia Starritt, text “Coyote Goes to the Sky” (WB_KL-08)

b. káruma ník apxanyámachas tá kunpíthxunátiihva yaas’arara iíin pu’iíthváaftiheeshap
káruma ník apxan -yámac -as tá kun- ip- íthxúuma -tih -va
in.fact a. little cap - pretty - PL PERF 3pl (>3s)- ITER- put. over. head - DUR - PL. ACT
yaas’arara - iíin pu- íthvaf - tih - avish - ap
humankind - OBV NEG- think. well. of - DUR - FUT - INV

‘The fact is, (the others) wear pretty caps, (but) Mankind won’t have much use for them.’
Source: Lottie Beck, text “The Story of Tan Oak Acorn” (WB_KL-30)

According to Bright’s description, -tih DUR never falls outside of -at PAST. The majority of examples of these pairs are in the expected order (e.g., [77a]). The unexpected order occurred in only one sentence ([77b]), which was a recently elicited sentence, so could represent speaker error or variation. There is no discernable difference in scope between the two orders.

(77) a. máhiit naxúrihitihat
máhiit na- xúrihi -tih -at
morning 1s- be. hungry - DUR - PAST
‘I was hungry this morning.’
Source: Vina Smith, elicited sentence (VS-05)

b. pachínim pa’ipita iímåak uvónfurukati
pa- chínim pa- ipit iímåak u- vónfuruk -at - tih
DET- skunk. sp. NOMZ- yesterday indoors 3s (>3) - enter. a. house - PAST - DUR

‘There was a skunk inside the house yesterday.’
Source: Vina Smith, elicited sentence (VS-11)

3.3 Lexicon Results
Pairs of verbal suffixes found in lexical entries are listed in the tables below. Number refers to the number of lexical entries containing the combination. No lexicalized combinations of prefixes were found. Note that when a particular affix has an allomorph conditioned by the other affix of the pair, it is not listed by the allomorph. One primary allomorph for each suffix is used in all cases.

<table>
<thead>
<tr>
<th>Affix 1</th>
<th>Affix 2</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ku ‘on’</td>
<td>-ara INSTRUMENTAL</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-ara INSTRUMENTAL</td>
<td>-riv ‘at rest’</td>
<td>(n=5)</td>
</tr>
<tr>
<td>-vara ‘in through’</td>
<td>-riv ‘at rest’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-rupu ‘downstream’</td>
<td>-mu ‘to’</td>
<td>(n=5)</td>
</tr>
<tr>
<td>-riv ‘at rest’</td>
<td>-ku ‘on’</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-varayva ‘around’</td>
<td>-ara INSTRUMENTAL</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-math CAUSATIVE</td>
<td>-ish(ríh) ‘down’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-rin ‘across’</td>
<td>-ish(ríh) ‘down’</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-chak ‘closing up’</td>
<td>-ish(ríh) ‘down’</td>
<td>(n=4)</td>
</tr>
<tr>
<td>-chak ‘closing up’</td>
<td>-suru ‘off’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-suru ‘off’</td>
<td>-rishuk ‘out of’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-riv ‘at rest’</td>
<td>-vaana ‘oneself’</td>
<td>(n=1)</td>
</tr>
</tbody>
</table>
Table 2: Pairs of inner suffixes occurring together

<table>
<thead>
<tr>
<th>Affix 1</th>
<th>Affix 2</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>-sura ‘off’</td>
<td>-vaana ‘oneself’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-sip ‘up’</td>
<td>-ara INSTRUMENTAL</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-ar ‘go to’</td>
<td>-ara INSTRUMENTAL</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-ar ‘go to’</td>
<td>-uk ‘hither’</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-raa ‘in’</td>
<td>-uk ‘hither’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-path ‘around’</td>
<td>-uk ‘hither’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-thana ‘around’</td>
<td>-ichva ‘pretense’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-ka ‘onto’</td>
<td>-ara INSTRUMENTAL</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-vaana ‘self’</td>
<td>-ara INSTRUMENTAL</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-kirih ‘into fire’</td>
<td>-ara INSTRUMENTAL</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-rip ‘completely’</td>
<td>-sura ‘off’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-shi BENEFACTIVE</td>
<td>-vrik ‘in response to motion’</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-tarar ‘fastening’</td>
<td>-ku ‘onto’</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-tarar ‘fastening’</td>
<td>-ish(rih) ‘down’</td>
<td>(n=6)</td>
</tr>
<tr>
<td>-taku ‘on top of’</td>
<td>-ish(rih) ‘down’</td>
<td>(n=2)</td>
</tr>
</tbody>
</table>

Table 3: Pairs of inner suffixes and va plural action

<table>
<thead>
<tr>
<th>Affix 1</th>
<th>Affix 2</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ar ‘go to’</td>
<td>-va PLURAL ACTION</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-faruk ‘indoors’</td>
<td>-va PLURAL ACTION</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-ish(rih) ‘down’</td>
<td>-va PLURAL ACTION</td>
<td>(n=5)</td>
</tr>
<tr>
<td>-kara ‘into the river’</td>
<td>-va PLURAL ACTION</td>
<td>(n=5)</td>
</tr>
<tr>
<td>-kiri INSTRUMENTAL</td>
<td>-va PLURAL ACTION</td>
<td>(n=3)</td>
</tr>
<tr>
<td>-kirih ‘into fire’</td>
<td>-va PLURAL ACTION</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-ku ‘onto’</td>
<td>-va PLURAL ACTION</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-kurih ‘into water’</td>
<td>-va PLURAL ACTION</td>
<td>(n=4)</td>
</tr>
<tr>
<td>-mu ‘to’</td>
<td>-va PLURAL ACTION</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-raa ‘to here’</td>
<td>-va PLURAL ACTION</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-ramnih ‘in’</td>
<td>-va PLURAL ACTION</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-rih ‘up’</td>
<td>-va PLURAL ACTION</td>
<td>(n=8)</td>
</tr>
<tr>
<td>-rip ‘off’</td>
<td>-va PLURAL ACTION</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-ripa ‘toward land’</td>
<td>-va PLURAL ACTION</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-ristuk ‘out’</td>
<td>-va PLURAL ACTION</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-riv ‘at rest’</td>
<td>-va PLURAL ACTION</td>
<td>(n=3)</td>
</tr>
<tr>
<td>-rupra ‘out through’</td>
<td>-va PLURAL ACTION</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-ruprih ‘in through’</td>
<td>-va PLURAL ACTION</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-rupuk ‘downriverward’</td>
<td>-va PLURAL ACTION</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-sip(riv) ‘up’</td>
<td>-va PLURAL ACTION</td>
<td>(n=4)</td>
</tr>
<tr>
<td>-sura ‘off’</td>
<td>-va PLURAL ACTION</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-taku ‘on top of’</td>
<td>-va PLURAL ACTION</td>
<td>(n=4)</td>
</tr>
<tr>
<td>-uk ‘hither’</td>
<td>-va PLURAL ACTION</td>
<td>(n=5)</td>
</tr>
<tr>
<td>-unih ‘down’</td>
<td>-va PLURAL ACTION</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-uraa ‘up’</td>
<td>-va PLURAL ACTION</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-vara ‘in through’</td>
<td>-va PLURAL ACTION</td>
<td>(n=5)</td>
</tr>
<tr>
<td>-vraa ‘over’</td>
<td>-va PLURAL ACTION</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-varih ‘to’</td>
<td>-va PLURAL ACTION</td>
<td>(n=1)</td>
</tr>
</tbody>
</table>
Table 4: Pairs of inner suffixes and middle position suffixes

<table>
<thead>
<tr>
<th>Affix 1</th>
<th>Affix 2</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ish(rih) ‘down’</td>
<td>-ahi ESSIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-kiri INSTRUMENTAL</td>
<td>-ahi ESSIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-koo ‘to’</td>
<td>-ahi ESSIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-rih ‘up’</td>
<td>-ahi ESSIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-vara ‘in through’</td>
<td>-ahi ESSIVE</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-oo ‘habitual’</td>
<td>-tih DURATIVE</td>
<td>(n=1)</td>
</tr>
</tbody>
</table>

Table 5: Pairs of middle position suffixes occurring together

<table>
<thead>
<tr>
<th>Affix 1</th>
<th>Affix 2</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ahi ESSIVE</td>
<td>-tih DURATIVE</td>
<td>(n=1)</td>
</tr>
</tbody>
</table>

Table 6: Suffixes following -va PLURAL ACTION

<table>
<thead>
<tr>
<th>Affix 1</th>
<th>Affix 2</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>-va PLURAL ACTION</td>
<td>-ar ‘go to’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-va PLURAL ACTION</td>
<td>-ara INSTRUMENTAL</td>
<td>(n=3)</td>
</tr>
<tr>
<td>-va PLURAL ACTION</td>
<td>-iichva ‘pretense’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-va PLURAL ACTION</td>
<td>-ahi ESSIVE</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-va PLURAL ACTION</td>
<td>-naa ‘plural’</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-va PLURAL ACTION</td>
<td>-tih DURATIVE</td>
<td>(n=1)</td>
</tr>
</tbody>
</table>

Table 7: Pairs of inner suffixes and -ach DIMINUTIVE

<table>
<thead>
<tr>
<th>Affix 1</th>
<th>Affix 2</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ara INSTRUMENTAL</td>
<td>-ach DIMINUTIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-riv ‘at rest’</td>
<td>-ach DIMINUTIVE</td>
<td>(n=1)</td>
</tr>
</tbody>
</table>

Table 8: Pairs of inner and middle suffixes with outer suffixes

<table>
<thead>
<tr>
<th>Affix 1</th>
<th>Affix 2</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>-faku ‘down from uphill’</td>
<td>-irak ‘place’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-tih DURATIVE</td>
<td>-han PARTICIPIAL</td>
<td>(n=2)</td>
</tr>
</tbody>
</table>

Table 9: Verbal suffixes occurring before deverbatives

<table>
<thead>
<tr>
<th>Affix 1</th>
<th>Affix 2</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ahi ESSIVE</td>
<td>-a DEVERBATIVE</td>
<td>(n=6)</td>
</tr>
<tr>
<td>-ar ‘go to’</td>
<td>-a DEVERBATIVE</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-ara INSTRUMENTAL</td>
<td>-a DEVERBATIVE</td>
<td>(n=43)</td>
</tr>
<tr>
<td>-ara ‘having been’</td>
<td>-a DEVERBATIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-ish(rih) ‘down’</td>
<td>-a DEVERBATIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-kiri INSTRUMENTAL</td>
<td>-a DEVERBATIVE</td>
<td>(n=8)</td>
</tr>
</tbody>
</table>
Table 9: Verbal suffixes occurring before deverbatives

<table>
<thead>
<tr>
<th>Affix 1</th>
<th>Affix 2</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>-μu ‘to’</td>
<td>-a DEVERBATIVE</td>
<td>(n=3)</td>
</tr>
<tr>
<td>-nāa PLURAL</td>
<td>-a DEVERBATIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-raa ‘up’</td>
<td>-a DEVERBATIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-raa ‘in’</td>
<td>-a DEVERBATIVE</td>
<td>(n=6)</td>
</tr>
<tr>
<td>-ripaa ‘in from river’</td>
<td>-a DEVERBATIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-roovu ‘upstream from here’</td>
<td>-a DEVERBATIVE</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-rupa ‘downstream’</td>
<td>-a DEVERBATIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-suru ‘off’</td>
<td>-a DEVERBATIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-tunva ‘together’</td>
<td>-a DEVERBATIVE</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-unih ‘down’</td>
<td>-a DEVERBATIVE</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-uraa ‘up’</td>
<td>-a DEVERBATIVE</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-va PLURAL ACTION</td>
<td>-a DEVERBATIVE</td>
<td>(n=3)</td>
</tr>
<tr>
<td>-vara ‘in’</td>
<td>-a DEVERBATIVE</td>
<td>(n=3)</td>
</tr>
<tr>
<td>-vunaa PLURAL</td>
<td>-a DEVERBATIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-va PLURAL ACTION</td>
<td>-aan AGENTIVE</td>
<td>(n=3)</td>
</tr>
<tr>
<td>-fip ‘completely’</td>
<td>-aan AGENTIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-ichva ‘in play’</td>
<td>-aan AGENTIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-thuna ‘around’</td>
<td>-apuh ‘having been’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-ish(rih) ‘down’</td>
<td>-raam ‘place’</td>
<td>(n=1)</td>
</tr>
</tbody>
</table>

Table 10: Verbal suffixes occurring after denominatives

<table>
<thead>
<tr>
<th>Affix 1</th>
<th>Affix 2</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>-hi DENOMINATIVE</td>
<td>-iichvu ‘in pretense’</td>
<td>(n=2)</td>
</tr>
<tr>
<td>-hi DENOMINATIVE</td>
<td>-ram ‘place’</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-hi DENOMINATIVE</td>
<td>-tih DURATIVE</td>
<td>(n=1)</td>
</tr>
<tr>
<td>-hi DENOMINATIVE</td>
<td>-unih ‘downhill’</td>
<td>(n=1)</td>
</tr>
</tbody>
</table>

3.3.1 Discussion

The following observations can be made regarding the lexicon data. Once again, the results are generally consistent with Bright’s classes (Appendix A). In fact, we can see from this set of data the reasoning for many of his ordering choices (why the causative, instrumental, and habitual suffixes are closer to the verb root than one might expect, for instance).

There are a few unexpected combinations, however, mainly involving variability in ordering between affixes from Bright’s Classes 2, 3, and 4. For example, we find -riv ‘at rest’ falling outside of -ara INSTRUMENTAL, and -ish(rih) ‘down’ falling outside of -math CAUSATIVE. It would be interesting to investigate whether these ‘inner’ classes could potentially be grouped together as a single position class with scopal ordering principles operating within it. On the other hand, since some of these stems are more lexicalized than others, it is possible that the anomalous forms involve a highly lexicalized root+affix combination with a productive suffix added outside, creating the appearance of unexpected ordering between the two suffixes.

Another interesting point is the relatively frequent collocation of certain pairs of suffixes, such as -rih ‘up’ and -va PLURAL ACTION, -tarar ‘fastening’ and -ish(rih) ‘down’, and -chak ‘closing up’ and -ish(rih) ‘down’. The great number of -ara INSTRUMENTAL and -a DEVERBATIVE combinations (n=43, while no more than 8 of any other pair was found) is quite striking.
As expected, -va PLURAL ACTION is found outside of the directionals. Less expectedly, it is also found outside of -tih DURATIVE. This pairing is counter to Macaulay (1990)’s decision to place the productive -va in Class 6. Once again, we must consider whether this form represents a more general pattern, or is exceptional due to a frozen -tih stem. Bright notes that these stems do exist, and can even be found with an another productive -tih suffix attached outside (Bright 1957:114).

A great number of affix pairs unattested in the text corpus are found in the lexicon. Data from these pairings can be used to flesh out the position template. But caution must be taken not to confound the data with highly lexicalized combinations.
## A Bright (1957) Verbal Morpheme Classes

Table 11: Schema of Bright’s Verbal Morpheme Classes

<table>
<thead>
<tr>
<th>Infl</th>
<th>Deriv</th>
<th>ROOT</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person/Number (n=18)</td>
<td>ip-iter</td>
<td>-va PLURAL ACTION</td>
<td>Positional (n=5)</td>
<td>Directional (n=38)</td>
<td>-ahi MODAL Valence changing etc. (n=21)</td>
<td>-ahi ESSIVE</td>
<td>-naa PLURAL</td>
<td>-rih DUR</td>
<td>-ach DIM</td>
<td>-i IMPER</td>
<td>=avish FUT</td>
<td>-han PARTCP</td>
<td>-ap PERSON</td>
<td>-at PAST</td>
</tr>
<tr>
<td></td>
<td>ip-iter</td>
<td>-va PLURAL ACTION</td>
<td>Positional (n=5)</td>
<td>Directional (n=38)</td>
<td>-ahi MODAL Valence changing etc. (n=21)</td>
<td>-ahi ESSIVE</td>
<td>-naa PLURAL</td>
<td>-rih DUR</td>
<td>-ach DIM</td>
<td>-i IMPER</td>
<td>=avish FUT</td>
<td>-han PARTCP</td>
<td>-ap PERSON</td>
<td>-at PAST</td>
</tr>
</tbody>
</table>