

% 0 \*U• U S Y C

# ë<¶ f ~ /Pç t ' Í A U ( - ],° §

!-EÒ/\_ 1 ; ; ã 1 á } 2

U< µ é,-U<!` UF # !B!` U „ FUCE!` U.ý '-@/çKŽU•!` U!`Bp#¼ µ é,-Fù%â ÊO, ÐU• 45Ñ UCE  
U< !>«,-'!` K -.ý '-@/çKŽ!>«, - K á;- :K!çFù%â ÊO, ÐU• f 8 UCE

Ž <?. K [ 9=x\*KJ«+°Fù>-!`BT &-IU• ç 2 / , ý5P K á;-+° • ù 3Í DKj fO~ j  
ª Ā 7 K á;- QFùU•\*K -(Û -62 ]U• Í#1A fO~ jª Ā 7 K á;- % K 2 / ö ç'¥ S+° • ùU• %  
A \f+° 9=xFù & ,\*K - Ž 9 £ 5Fù>- ; u & °A/ c , 2 ¼"WA 8â +° œ šU•Fó\*T4 @Í ,%œ7Ž  
Ý5€ Ò 2 ¼" 2 ¼ á;- \ Ž %3Í DKj fO~ jª Ā 7 K '¥ S+° • ù 3ÿ È=" :U• 9 8 á;- \ Ž+° K  
'¥ S . j9fU•,\$ % °•66 • ,L1F •U• 3!Ë K )2 B SBT+° SF 2 3 3 WFù ,P U• Ú\*K'•œFû ,  
FU• K Fç" g S , SUŽ 9 8 á;- \ Ž+° K '¥ S 3 3 K +°,\$ Ý S .D- SU• : •66 • ,L1F •,\$! U•  
3!Ë+° K )2 B SBT 3 3 : K Fç ö Ú\*K'• 3 3+° j9f •,\$ Ý : j Ê FU• K '¥ S : 3!Ë+° Ý5€ Ò <  
,P UŽ 3!Ë Ž <+° Ú(Û - ü s ² K '¥ SU• f 9=x Ž 9 ü Ç ² 5 U+° • " •U• Ì S á;-!Ë+°(Û -  
-@/ç f EK Ž 9A \f+° K : 9=x ü Ç.ý ' É š  
@KdB K UŽ á;- \ ŽUŽO~ jª ĀUž3Í DKj f  
c 4 <2± - 4 ½)d =Aü.7 "

3Í DKj f [= )!` K"m ] QFù+° \f w ,  
7 B3Ö , • S>ð M 9 =EL Ā 'U•!` K  
"m ] Ā \ : j!ç)2 U% UÀ U• r SLŽ/ +°O~ jª 3Û Ā  
„ T!` K"m ] QFù Ā 7 9=x/, =0u(ÜA• U% UÀ •  
yU• f á3Í DKj fO~ jª 3Û Ā+°\*K -K MĀ Ā \ Ý  
" U%- UÀ Ā 7!` K"m ]>ð . U%- UÀ Ā 7 9=x Ž 9 Ā  
\Fù>ð U% UÀ Ź K ^ f\*K -2'4 +°Fù>-3ð <F 2U•  
< Ā \D- F-@/ç U%- UÀ &b58U• %3Í DKj fO~ jª  
Ā á;- \ Ž+° K '¥ S Ý" D- =  
\ Ž [!` K"m ]+°Fù>- |U• , áLŽ \ Ž • ù  
,!` K"m ]Dó/7U• , áLŽ!` K"m ]EL <+° \=" K  
'ç XDü ,!µ/ Dó/7Fù },! \ ŽU• ú58 Ž < Ü  
+° á;- \ ŽU• @!Ë Ac0u U% UÀ 8 "U• á;- \ Ž •  
ù,! Ú!@ E ,!` K"m ]0uU• • < [ K Ž <+°Fù  
>- | U%- UÀ á;- \ Ž+°!¥ - 3 3 ö ü á"  
5A\$ F-@/ç U% U• UÀ G °3Í DKj fO~ jª Ā 7  
á;- \ Ž+° K '¥ S-@/ç+° 9BßU•E5 •66 • L1  
F • , 3!Ë .ù á;- \ ŽU•EFDóFú BA/ cU•Fó

\*T4 @Í ,%œ7Ž Ý5€ Ò0u á" U• Í@Ô3Í DKj fO~ j  
ª Ā 7 9 8 á;- \ ŽK+° K '¥ S . 0 á;- \  
Ž K '¥ S 3 3 K +°,\$ Ý SU• ö K '¥ S : á;-  
\ Ž+° Ý5€ ÒU•K< : á;- \ Ž % K '¥ S+° • ùU•  
fFó\*T /7 Ö é EK Ž 9A \f+° K : 9=x ü Ç  
.ý ' É š

## 1 | Ā : á"

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-@/ç f y °!>«, -B• ëU< ° Uá ° •U•  
° Uá ° •&UCE+° z • DKj fU• K f7Ý Ā  
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N U•!@ E f Y Æ& R DKj •Mú#«"Ò!@ EU•  
sKy!`Fù N NU•Kò Y T 4U• s#U Ò  
U• L /#U f U• s LHK E  
-@/ç c \ TB• ë S\*\ •U< ° • Žjá  
° • ŽU• ° • Žjá ° • ŽUCEU•

) á7 &b.ý ' &FyM¥, U< UCEBp Ő 4 V Q Q P S U F E C Z U I F O D B F U' P P V O B E M B U B B O S F B C M \$ A I D O B U < / P  
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C B O H X F O C F T U ! D P N  
b/k KU• Už b \ e/k KU•

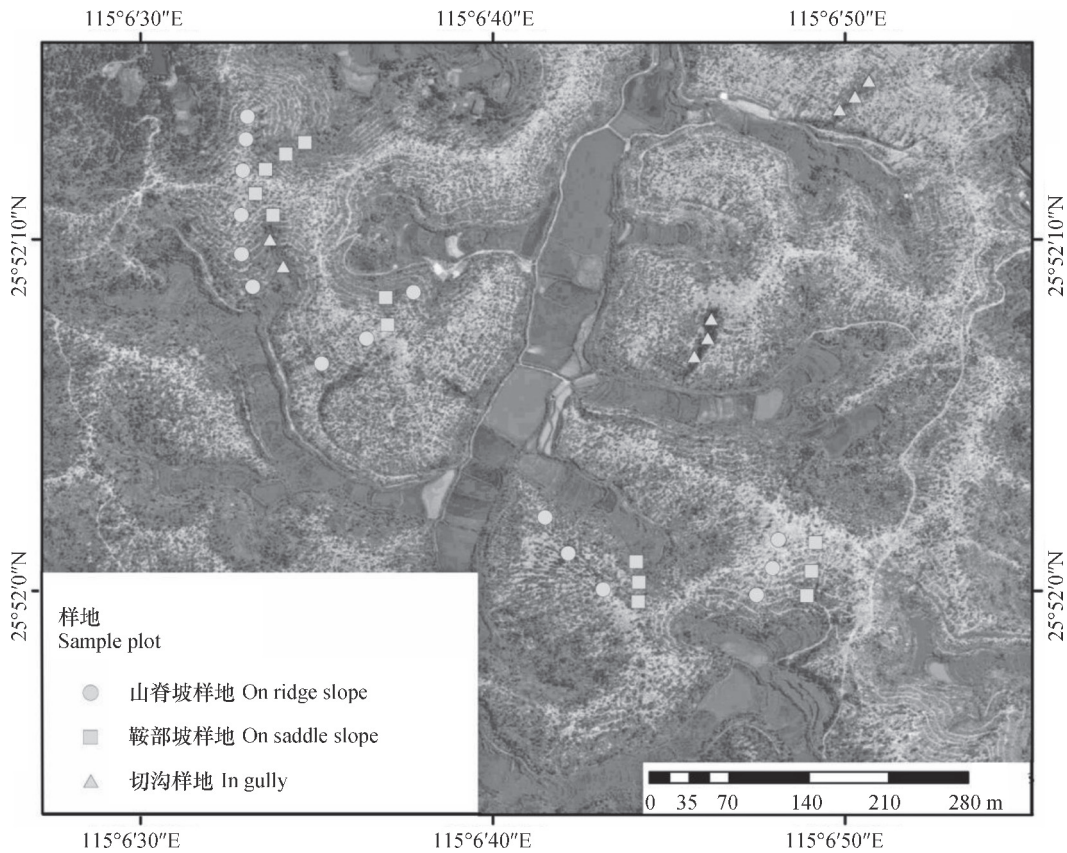
, \$ % P Ò Uá NU• • Ò á ° f O~ j a  
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 °8~7È'á -U• Æ 2 æ f ž œDŞ ÚU• Æ \E, B : jUž  
 Æ 78u=x/, \* »U•%x T/, =U•K\_ • vK\_ • 9=x, Ò  
 ñ f U•8u=x 9'• g>- f7¾9-U< *Dicranopteris*  
*dichotoma* UÇE , + ©81U nperata cylindrical UÇE Už K  
 =" K n" m ] ² i U• ù BT n > \$ L ^ U ž 3 ò ! È " q ! È ò Ò  
 > L N L N U Å É š ! ' U F K á ; - 21 Ş 23 Ó  
 3 ò U¾ U Å - @ / ç \ + ° K á ; - f Ò , / 7 Ò 2 W D ê \  
 Y Ò , f % ô 6

1.2 < B9 Æ m i #  
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 c \ 2 • L Ž , á ; - ! È E = x / @ ê U • • L Ž c \ 2 •  
 66 • , L 1 F • U • á ; - ! È f 3 ! È U • 3 ! È ¥ - > í ="  
 T c \ f E 5 ² V =" S • D U • T û V • D + ° •  
 66 • L 1 F • , 3 ! È Y U • 2 W ! è • L Ž á = K » f / @ ê  
 • c R U • 2 6 Y 7 • y 0 @ ê V L Ž / f N f  
 N + ° c \ U • • 8 ã Æ V c \ U < \* U Ç E f i 6 )  
 † \ F ó c • " , 7 U • F ó c " - š - @ / ç f V K K  
 K y L U¾ U Å T / @ ê + ° c \ F ø U • K • / W ! F ù U \* T  
 5 % 3 K » f % V % á + ° =" n K U < U á D N U Ç E

> ž 1 < =" Ö ( - .

Table 1 \$ IBSBDUFSJTUJDT PG UIF HVMMJFT VOEFSTUVEZ

!È # (VMMZ OVNCF S	LŽ/ " S F B W Ç E	, S# Ò . B Y J N V N E F Q U I U < N U Ç E	ÿ s# Ò " W F S B H F E F Q U I U < N U Ç E	!È J « - F O H U I U < N U Ç E	!È s é " W F S B H F X J E U I U < N U Ç E	!È ý P + ° • L Ž • Ò 4 M P Q F U < c U Ç E
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\* c \ / @ ê \*  
 ' J H % J T U S J C V U J P O P G T B N Q M F Q M P U T  
 I U U Q U • Q F E P M P H J D B J T T B T B D D O

=xÎ"w8ã U•K cí[ %= " n K U• Uá D NUCE  
 K» fFóKò %ã3ð <+°## 4 c K cíFóKò :U• ç  
 K•Dˆ S+° - j , 9'• e "0uU• û V cí 2 < )U•  
 , ) j° Ü0Ý ã:ûU• , )E« uMú ŽU•Dó0‡ :  
 3\*T

1.3 < U ( ]#• Ð

K 5 f-ß "IZ ".# "Iê -Ý? !Z 5  
 t.# EK tlê Q )U•K! C UCE , K MÃ1¾3ð  
 <Fó\*TQ- @•U¾ UÀ° á" 2 ¼ K Fç"g SFó\*T Ý  
 a8—U¾ UÀ° 2 ¼ á" U•:C2 Fç"g SFó\*T U• ,-%o &  
 ! "Fã! 7ž" Už6^Fç"g SFó\*TL‡F‡: ! 7ž" UžFã S  
 .#FãFç"g SFó\*T.#Fã8 ,!l! 7ž" UžDó!S B!NFç"g  
 SFó\*TP J\Fã!ê\$ Æ" K Ú\*K'• œFûFó\*T/,Fö  
 Ý «" U¾· UÀ°•3ò8ø ,K8ø , j3è8ø+°"w Æ 2 WE5  
 \*T‡5µ6»;÷+©6 % § & 1 % " % § & ,P!; # %  
 § &U•û , " Ò Û Ò @ê4š VFù 9

1.4 < | ã : \* <

9 8 á;¬ \ Ž+° K '¥ S .@ð #Fó\*T ø j á  
 2 ¼U• - 4 %UCE á" U• 0 3 3K +°, \$ Ý S 2 ¼Fó\*T  
 0¬ •, \$ Ý 2 ¼U• 1 F B S T P OUCE" U• K '¥ S : á;¬ \ UCE@Í0Ã 0 á;¬ \ Ž+° 3 3 » CU•! Dˆ » CUCE  
 Ž+°, \$ Ý ÒFó\*T%œ7ž Ý5€ Ò 2 ¼U• UÀ°

%œ7ž Ý5€ Ò 2 ¼ á" [ T%œ7ž2'4 &-l 6\*T  
 Ý5€ Ò S ; ûE 2'4 ý •Dó/7 Y 2L, \$ % B+°B•  
 ëU• ç & X I [ e š » C 3è • Ž'â+°, \$ h/7  
 Ò ' P Û ç5€2' [ R2S òU• 3èB¶DýU•5€2'B¶2S  
 òU• ù w ] ; 9 8 á;¬ \ Ž : K '¥ S+° Ý2'U•  
 EFDó , Æ+° œ š 0)2U• a & ¬ +° Ý5€ SU•  
 Í2N á;¬ \ Ž % K Ž < ý5p+° • ù %œ7ž Ý5€ Ò  
 2 ¼0-E @ 7U•

UCE î! œ C , ! Dˆ œ C+°-š Æ T á;¬ \ Ž  
 %œ7ž2'4 FøU•@BMU•NUCE f@ð #- KaU• Ý f!  
 Dˆ » CU• ç YM f@ð # %A• V œU•f@ð # 3 3 V  
 œUžU• U•NUCE f î! » CU• X ³E5 á;¬ \ Ž 0  
 K '¥ S 3 3 Y+° , D 3 3 ^ f î! » C U¾ UÀ°

UCE œ š ~ , B 0)2 f"K•2'4 Y 9 8 3 3  
 +°Fû3pU•Dˆ Ž f ! Dˆ+° œ š CU•Fó\*T I h B á"  
 U• ; U• UCEUCE % È ÷ œ šE =x ~ , B 0)2

$$A'(i,j) = \frac{A(i,j)}{A(0,j)} \quad U \subset UCE$$

$$\varepsilon(i,j) = \frac{\min_j |A'(0,j) - A'(i,j)| + \max_i |A'(0,j) - A'(i,j)|}{|A'(0,j) - A'(i,j)| + \rho \max_i |A'(0,j) - A'(i,j)|} \quad U \subset UCE$$

; YU• εU•iU•jUCE f0XV á;¬ \ Ž0Xj V 3 3+° Ý5€  
 2' œ U min min | A'(0,j) - A'(i,j) | f P - , ;  
 U• max max | A'(0,j) - A'(i,j) | f P - , S Už  
 ρ f 2DÔ2' œU• h8/ fU¾ U• UÀU• X ³ Už  
 i U• U• U•MUž U• U• U•V  
 UCE Ý5€ Ò+°!n ú Ý5€2' œ+°@Í0Ã ' ,7U•  
 Æ \+° [ 0! Dˆ œ C : î! œ C T 3 3+° Ý5€2' œ  
 hU•3ÿ ÈDˆ FU• >Dó ° 2 •U• 58 5 ñ>- 2 û V  
 ! Dˆ œ C 0 3 3+° Ý5€2' œKò Y •(Û T , V h 6U•  
 E V h ] [ Ý5€ ÒU•U•U• d\*T+° á" f Ý s h  
 " U•>í ; U• UCE Ý5€ ÒB¶ SU• 3èB¶Dý

2 3ÿ È  
 2.1 < C B ë<¶ f ~,° U ( ]  
 3Î DKi á;¬ \ fOˆ j a Æ 7 á;¬ \ Ž+° K  
 )2 B SBT YK• ".# , f Ü3ð <+°-.1¼ BU•=" UCEU•  
 ç 3 3 á;¬ \ Ž+° • ù . j9f •66 •+° I  
 5 K B ' 3 3 h , ; U• "IZ , ".# TL'F •+° K  
 Y WFû , SU• 2 WDê \ H L H H WžH  
 5 f-ß "Iê -Ý? !Z 5 t.# EK tlê , Q ) s  
 T 3!È+° K Y=" (Û , SU• 2 WDê H L H  
 H L H N H L H N H L H  
 N H , L H •66 •+° K W!Fû , ; U•  
 U• 3!È+° K W!Fû , SU• f  
 É š ")OX , M K š Ô8|+° K § 2 WFû  
 23Ó 3 òU•·-/@ f+°Oˆ j a Æ 7 K § 20u  
 3ÓDˆ z 0 á;¬ \ Ž+° K 5 fBT s < H W•H

$$r_i = \frac{1}{N} \sum_{j=1}^N \varepsilon(i,j) \quad U \subset UCE$$

I 5 œ š4 @Í : 0)2 T 4 1 4 4 , & Y D F M  
 Y , <

0 ° 3Ó ö 7U• Š °/94f 7!` ÝUž K "IZ  
 < H U• 0° 3Ó ö 7U• [ 5L'F •+° "IZ  
 Dê \ H U• 0° 3ÓU• Š °4f+°!` ÝUž-Ý? !Z  
 < N H U• 0° 3Ó ö 7U• 5 3!Ë+°-Ý?  
 !Z f N H U• \ 3ÓU• Š ° Y0u!` ÝU•L1  
 F • ,•66 •+°-Ý? !Z 0 ° 3ÓU• Š °4f+°!` ÝUž  
 5 t.# < N H U• 0° 3ÓU• Š ° -4f+°!` ÝUž  
 EK tlê < N H U• 0° 3Ó ö 7U• 5 3!Ë  
 +°EK tlêB±Dó N HU•LŠH/94f!` Ý 4( 6 2  
 ¼U•-@/ç f á;- \ Ž Y K § 2 3 3 Y ñ 5 3!Ë+°  
 -Ý? !Z 0 ° Y0u!` ÝU• ç 3 3 s 0 °/94f B4f+°  
 !` Ý A :3Í DKj f!` K"m ] QFù+°O~ j a Ā K  
 § 2BW+LU• K 5Ñ ÇD` E g>- [ ² , æ f  
 +° Ë U• P ç T B3Ö Uá U• Ë 5 9=xE™; - \ ŽU• 3!Ë+° K Ú\*K'•á á , ©  
 \ í%™ S-` {U• ì " ²!` K"m ] ý\*KU• (7 =" K  
 "m ] ² iU• ï K n\*F7 ùBT n>\$L^U•\*K -(Û - ç  
 B<sup>U% UÀ</sup>, 7 B3Ö , ÷ @Đ@ò \K MĀ+° QFù  
 SU• , • 9 =EL ĀU• r !` K"m ] (7 +° K \E, B

QFùU• 6)E5 • KO~ j a ^ f tJ7 =.ù U% U• UÀ  
 F 'U•;©&b\*K -(Û - :j e ° U% UÀ U• r K §  
 2 WFù ù&bD` zU•-.1¾ WFùDê \ U• K 3ÿ  
 °Í 5 :j e ° 3Í DKj á;- fO~ j a Ā 7 K  
 5Ñ Ç i0ÍD` U• r 9 8 á;- \ Ž+° K )2 B'¥ -="  
 (Û & ² j9f S .U• 3!Ë K § 2+° F œ 3 30u3Ó  
 :jP °•66 •U<=" UÇE  
 3Í DKj fO~ j a Ā 7 á;- \ Ž+° K YK• j  
 3è8ø BU•3ò8ø ,K8ø , Ú\*K'• gFù 9 8 á;- \ Ž  
 +° • ù .j9fU<=" UÇEU• ç œFù T 9 8 á;- \ Ž  
 Y+° S ;M! » f 3!Ë >L'F • > •66 • 3!Ë+°3ò  
 8ø ,K8ø , Ú\*K'• g œ 2 WD` •66 •, \$ À Ú\*K'• œ  
 FùP A :,\$ % ç á  
 3Í DKj fO~ j a Ā 7 á;- \ Ž+° K Y6^Fç  
 ,Dó!S B!NFç" g S 9 8 á;- \ Ž+° • ù .j9f  
 U<=" UÇEU• ç T 9 8 á;- \ Ž Y=" (Û f 3!Ë >L'F  
 • > •66 • 3!Ë Y+° K 6^Fç ,Dó!S B!NFç" g S

>ž2 < ë<¶ f ~,° U \* < L ]C^

Table 2 1 I Z T J D B M B O E D I F N J D B M Q S P Q F S Q U R S N P G U I F T P J M J O F S P

á;- \ Ž	5 f-ß	"IZ	".#	"lê	-Ý? !Z	5 t.#
& S P T J P O B M B O E G P S N H U Ç E	B M B O J D \$ P U B M /	5 P U B M 1	5 P U B M ,	" M L B M J O F	" W B J M B C M F 1	
•66 • 3 J E H F	d B d B	d B	d B	d B	d B	d B
L'F • 4 B E E M F	d C d C	d B	d B C	d B C	d B C	d B C
3!Ë ( V M M Z	d D d C	d B	d C	d C	d C	d C

á;- \ Ž	EK tlê	f Ü3ð < . F D I B O J D B M D P N Q P T J U J P Q U R S N P G U I F T P J M
& S P T J P O B M B O E G P S N H U Ç E	B M B O J D \$ P U B M /	- .1% 4 B O E 1µ1% 4 J M U S ú1% \$ M B Z N P J T U V S F
•66 • 3 J E H F	d B d B C	d B d B d B d B
L'F • 4 B E E M F	d C d B	d B d B C d C d C
3!Ë ( V M M Z	d D d C	d B d C d B C d C D

" U • 8 C 9 8 f ù = . f p < !` Ý . j9fU• Ý sh d 3 ò A U ž 7 8 / P U F U • % J G G F S F O U M F U U F S T J O U I F T B N F E J G G F S F O D U Ç E U • N F B O W B M V F d T U B O E B S E F S S P S 5 I F T B N F C F M P X

>ž3 < ë<¶ f ~,° U ä+U(Ý(-

Table 3 \$ I B S B D U F S J T U J D P G T P J M N J D S P C F T S F M B U J W F U P F S P T J

á;- \ Ž	3ò8ø # B D U F S J B T, K8ø ' V O H J	j3è8ø " D U J O P N Z D É U K F ç œ . J D S P P S H B O J T N B N P V
& S P T J P O B M	M B O E G P S N H U Ç E	Uç \$ ' 6 H U Ç E
•66 • 3 J E H F	d B d B	d B d B d B
L'F • 4 B E E M F	d B C d B C	d B d B d B
3!Ë ( V M M Z	d C d C	d B d B d B

>ž4 < ë<¶ f ~,° U G-#q ]

Table 4 4PJM FO[ZNF BDUJWJUZFMBUJWFUPFSPTJPOBM MBOE

á;- \ Ž	:C2 Fç * OWFSUBTF	6^Fç 6 SFBTF	F S.#F Fç " DJE	QIPTQIB	USBTNFç	\$ BUBMBTF
& SPTJPLW	M HMVUDP	TUÇEUEU< NH /H)U<	IUCUEU< N H OJUSPQI	FUCPEUM	NHM	N.P.M-O HJCE
MBOEGPSN	U< UCE	U< UCE	U< UCE	U< UCE	U< UCE	N J OUCÉ
•66 • 3 JEHF	d B	d B	d B	d B	d B	d B
L'F • 4 BEEMF	d B	d C	d B	d B	d B	d CD
3!Ë ( VMMZ	d B	d C	d B	d B	d B	d D

2 W! •66 •, \$ ÁFç" g SP , \$  
 % ç á;- \ ŽU• 3!Ë+° 6^Fç , Dó!S B!NFç" g S ,  
 P U•A : 3!Ë+° K (Û - 5 U °!Z2L+° D~ B , Dó  
 !S B!N+° 2?

2.2 < : ë<¶ f ~,° U \* < L J C^ D U G- Á ä+U  
 (ŸL\*,° ©31

3Í DKj á;- fO~ j a Ñ 7 •66 •+° K  
 Y 5 ".# -Y? !Z , K !' 2 : K Fç B Ú\*K

'• j9f, \$ ŸU<=" UCE ".# : 3ð8øU<r UCE 8ø - j9f •, \$ ŸU< r UCEU•; ©&b : 5+° 3ÿ È  
 , K8øU<r UCE j3è8øU< UCE ö Ú\*K'•, \$ h U% U U r ç È 5 ±E , '-@/ç 5 t.# :

gFûU<r UCE - j9f •, \$ ŸU•E : Ú\*K'• £ , K8ø j9f •, \$ ŸU< r UCEU•E : Ú\*K'• £ 5?  
 5? .# ^\*T, \$ , 7 U% U^A : •66 • ".#; ©&b W .# ^\*T 5 Ÿ K !' 2 : 6^Fç" g S - j9f •, \$ Ÿ

FûD~ zU• r % Ú\*K'•+°. ù1§ , œFû - çFû>- U<r UCEU•E [ fL1F •+° 9=x • ", \$ %D~  
 -Y? !Z : K 6^Fç - j9f •, \$ ŸU< r UCEU•©U•A : T 9=x • "D~ , 7 +° (Û - YU• K !' 2 %

E : 6^Fç £ 5 2? !Z2L ^\*T, \$ , 7 K !' 2 6^Fç" g S £ 5 ü s ^\*T  
 : K Fç , Ú\*K'• tBK, \$ Ÿ Ÿ2'U• ç Y : 6^Fç 3Í DKj á;- fO~ j a Ñ 7 3!Ë K Y+° 5

U<r UCE F S.#F FçU< UCE , Dó!S B f-B "IZ -Y? !Z , 5 t.# s=" (Û & ^2 : K Fç  
 !NFçU<r UCE - j9f B j9fBK, \$ Ÿ E g>- [ B Ú\*K'• j9f, \$ Ÿ SU<=" UCE 5 f-B : K 6^Fç

•66 •+° K !' 2 zU• (7 \*KJ« 5 9=x+° K ! \  
 ="> \$L^+° K !' 2 z U% U^A U•I U••66 •+° K !' 2  
 , \$ %D~P +°F) [ \="> \$L^ 0U•58> \$L^+° \=" !Í 5 9  
 =x\*KJ« « Ñ K Ú\*K'•D~ =U• K Fç" g SD~ z U% U^A

3Í DKj á;- fO~ j a Ñ 7 L1F •+° K Y  
 "Iè 5 t.# Q ) , K !' 2 : Fç" g S B Ú\*K'•

= " (Û & j9f B - j9f, \$ ŸU<=" UCE K "Iè : F S.#F Fç j9fBK, \$ ŸU< UCEU• K Q ) : , K

UCEU•; ©&b : 5+° 3ÿ È  
 , K8øU<r UCE j3è8øU< UCE ö Ú\*K'•, \$ h U% U U r ç È 5 ±E , '-@/ç 5 t.# :

gFûU<r UCE - j9f •, \$ ŸU•E : Ú\*K'• £ , K8ø j9f •, \$ ŸU< r UCEU•E : Ú\*K'• £ 5?  
 5? .# ^\*T, \$ , 7 U% U^A : •66 • ".#; ©&b W .# ^\*T 5 Ÿ K !' 2 : 6^Fç" g S - j9f •, \$ Ÿ

FûD~ zU• r % Ú\*K'•+°. ù1§ , œFû - çFû>- U<r UCEU•E [ fL1F •+° 9=x • ", \$ %D~  
 -Y? !Z : K 6^Fç - j9f •, \$ ŸU< r UCEU•©U•A : T 9=x • "D~ , 7 +° (Û - YU• K !' 2 %

E : 6^Fç £ 5 2? !Z2L ^\*T, \$ , 7 K !' 2 6^Fç" g S £ 5 ü s ^\*T  
 : K Fç , Ú\*K'• tBK, \$ Ÿ Ÿ2'U• ç Y : 6^Fç 3Í DKj á;- fO~ j a Ñ 7 3!Ë K Y+° 5

U<r UCE F S.#F FçU< UCE , Dó!S B f-B "IZ -Y? !Z , 5 t.# s=" (Û & ^2 : K Fç  
 !NFçU<r UCE - j9f B j9fBK, \$ Ÿ E g>- [ B Ú\*K'• j9f, \$ Ÿ SU<=" UCE 5 f-B : K 6^Fç

>ž5 < §7@ — U \* < L J C^ D U G- Á ä+U (Ÿ,°. © ]

Table 5 3FMBUJJPOTIJQCFUXFFO TPJM QIZFTQ PZNFIF NBCEB IM JDS P C F S U J J F TU BFO E PTJRMJ M

:C2 Fç^	6^Fç^	F S.#F Fç^	Dó!S B!NFç^	3ð8ø^	,K8ø^	j 08ø ^	Ú*K'• g œ^1
5 f-B ^	"IZ -	".# ⑩	"Iè ⑫	-Y? !Z ⑬	5 t.# ⑭	EK tlè ⑮	Q )
K !' 2 ⑯							

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 U< " \$ 1UCU• Y \$ BUBMBTFU< \$ " 5UCU• Z # BDUFSJBU• [ 'VOHJU• \ " DUJOPNZDFUFTU• ] . J D S P S B I B O I W T N B N F  
 ⑩ 5 P U B ⑪ M L B M ⑫ F V B J M B C M W B U M B C ⑬ P F J M U N P J T U V S F 5 I F T B N F C F M P X

K

!-EÒ/\_0uU• á;- \ Ž %O~ j a Ã 7 K '¥ S+° • ù

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Table 6 3 F M B U J P O T I J Q C F U X F F O T P J M Q I Z F T Q [ Z P N D F I F N B J O E B M J O S P Q F S U J O F T U B F O E P T U R M

	:C2 Fç <sup>V</sup>	6^Fç <sup>W</sup>	Fα S.#FαFç <sup>X</sup>	Dó!S B!NFç <sup>Y</sup>	3ð8ø <sup>Z</sup>	,K8ø <sup>I</sup>	j 08ø <sup>\</sup>	Ú*K'• g œ <sup>I</sup>
5 f-ß ^								
"!Z -								
".# <sup>11</sup>								
"!è <sup>12</sup>								
-Ý? !Z <sup>13</sup>								
5 t.# <sup>14</sup>								
EK tlè <sup>15</sup>								
Q )								
K !' 2 <sup>16</sup>								

>ž7 <="Ö U \* < L ]C^ D U G- Â ä+U(Ÿ,°-. © ]

Table 7 3 F M B U J P O T I J Q T C F U X F F O T P J M Q I Z F T Q [ Z P N D F I F N B J O E B M J Q S P Q F S U J O F T U B F O E P T U R M

	:C2 Fç <sup>V</sup>	6^Fç <sup>W</sup>	Fα S.#FαFç <sup>X</sup>	Dó!S B!NFç <sup>Y</sup>	3ð8ø <sup>Z</sup>	,K8ø <sup>I</sup>	j 08ø <sup>\</sup>	Ú*K'• g œ <sup>I</sup>
5 f-ß ^								
"!Z -								
".# <sup>11</sup>								
"!è <sup>12</sup>								
-Ý? !Z <sup>13</sup>								
5 t.# <sup>14</sup>								
EK tlè <sup>15</sup>								
Q )								
K !' 2 <sup>16</sup>								

j9f •,\$ ŸU< r UœUž "IZ :3ð8øU< Uœ 3 @Ô @æ  
 ,K8øU<r Uœ j9f •,\$ ŸUž-Ý? !Z : K Ú  
 \*K'• gFû j9f •,\$ ŸU< r UœUž 5 t.# :6^Fç 3.1 < C B ë<¶ f ~ U ( ^ ],° \$ 8  
 U<r Uœ 3ð8øU< Uœ j9f •,\$ Ÿ E Ç 3Î DKi á;- fO~ j a Ã 7 K § 2 i0Í,\$  
 ,\$ Ÿ S <=x Ÿ a8—<sup>U%</sup> <sup>UÀ</sup> B;!%<sub>00</sub> H0U<sup>U%</sup>- <sup>UÀ</sup>@í : %BW+LU• r 9 8 á;- \ Ž+° K '¥ S . j9f .  
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 Ž+° 0M¥ K '¥ S 3 3 Y+° , D 3 3 ^ f ! » /!K . g>- [\*] K á;- AB£+° <sup>U%</sup> <sup>UÀ</sup> f K  
 CU• 0 á;- \ Ž+° K '¥ S 3 3 ^ f ! D~ » CU•Fó á;-7 « K § 2"m ]U•58 K § 2"m ] : K MÃ  
 \*T%œ7ž Ÿ5€ Ò" 2 ¼ K '¥ S : á;- \ Ž+° Ÿ5€ 1¾3ð < Ÿ2' ò 3<sup>U%</sup> <sup>UÀ</sup> K !Z.#"m ] g>- " !Á3ÿ  
 ÒU•3ÿ È>í=" K '¥ S : á;- \ Ž+° Ÿ5€ Ò S 4 - f g <sup>U%</sup> - <sup>UÀ</sup> T á;- \ Ž YU••66 • ';- f  
 ;M! » f 3!ÈU< UœL'F •U< UœE•66 • gU•L'F • XDü f gU•/\_ ÆE+°!È ¶ !µ/ f gU•  
 U< UœU• K '¥ S : 3!È+° Ÿ5€ Ò , S A :,\$ •U• !µ/ f g+° 3!È!Z.# WFûU•K•".# BF) j  
 !•66 • ,L'F •U• 3!È %3Î DKi á;- fO~ j a 9fP °•66 • 5 fBT ,lè2L á ?=x K Sû1¾ d  
 Ä+° K '¥ S • ù , S Kp<sup>U%</sup> <sup>UÀ</sup> U•58Sû1¾ á ? T á;-Dó/7 Y øKø<sup>U%</sup> <sup>UÀ</sup> I

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Table 8 \$ P S S F M B U J P O D P F G G J D J F O U T C F S I X M B O J T W P J J M Z C F R Q F S O Z T P Q M J Q B P Q B F O S E U D P T S

ÿ5€2' œ \$ P S S F M B U J P O D P F G G J D J F O U î ! » C				
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Dó!S B!NFç				
3ð8ø^				
,K8ø^f				
j 08ø ^				
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U•ú•66•\L'F •\ 3!Ë+° á;-Dó/7 YU•E<  
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 K Sù1¼ 5 fBT ,lê2L+° WFû T á;- \ Ž+°=" (Ü  
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• , K \ U\*T+° K !' 2/!K 2 / g>- \ Ž  
 , K SBT+° • ù U% - U^ á;- \ Ž K !' 2 WFû  
 S ;M! » f 3!Ë >L'F • > •66 •U• 5 V È U•  
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 , 3!Ë K Sù1¼ WFûE<#< È SU• ú58 « Æ K %!'  
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 8 á;- \ ŽK . j9fU• œFûP z É M f 3!Ë >L'  
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+° ÷9i'• ö K § 2 =L'F • , 3!ËDü Ô U% U^ •Ky  
 z ² •66 •+° Ú\*K'•Už , [ f K Ú\*K'• : K  
 5Ñ Ç , 9=x'â á Ý2' ò 3 U% U^ Úž\*] ° 3!Ë ,L'F •  
 +° K )2 B 3 3,\$ %D^P U•7 « Ú\*K'•Fû <D^P  
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 h U% U^ : •66 •,\$! U•L'F • , 3!Ë+° K 5 f  
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 È ì 9 , 9U• P51 È q Ò 9,\$ ,7 E g  
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 l' " Æ+° Ú\*K'•-β#¼ AN6) ÇD^ ] U% U^ Úž ì 6 á;-  
 \ ŽEL <+° u& 0u BF • "+° .U• ,3ð (7 á;-  
 \ Ž Y K Ú\*K'• œFû : K 5 f-β 9 ,7  
 3.2 < C B ë<¶ f ~ U = =L\*- . © ] \$ 8

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: K Ú\*K'• ,B£ • 8 Ô Ô K +° ANDó/7 U% UÀ  
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 : K 5Ñ Ç , 9'•9Q § Ÿ2' ò 3 U% UÀ X-@/ç f Š  
 ° 81§ ùBT ý5P+° K U• © È 9 8 á;- \ Ž+° K  
 (Û - ,BTFû,\$ 8U• ç K 3 3K +°,\$ Ÿ S ÀA , \$  
 8 &b58U• X-@/ç Y 9 8 á;- \ Ž+° K 3 3K +°  
 , \$ Ÿ S „ T, l : j .U• • ©U• T •66 • Y 5 ”  
 .# -Ý? !Z :6^Fç 3ð8ø ,K8ø t(Ü & j9f •,\$  
 ŸUž TL1F • 5 5 t.# Q ) , K !` 2 :6^Fç  
 ,K8ø=”(Ü & j9f •,\$ ŸUž58 T 3!È YU• 5 f-ß  
 ”!Z -Ý? !Z , 5 t.# :6^Fç 3ð8ø ,K8ø , Ú\*K  
 '• gFû s t(Ü & j9f •,\$ Ÿ : •66 • ,L1F •,\$  
 ! U• 3!È+° K )2 B SBT 3 3 : K Fç ö Ú\*K'• 3  
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 \ Ž+° Ÿ5€ Ò S ;=”(Ü f 3!È >L1F • > •66 •U•  
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 .ç XDü ,!µ/ +°E@ ° , y4šU• • ù ² \=" +° u&  
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 Ž < e ²! K"m ]Dó/7U• « Ā •66 • ,L1F • +°  
 á;- \ !Ā!µ/ ° •U• ĩE ² IF \ Ž 0+° K Ž  
 <U• ú58 f 9=x Ž 9 GEL ² 5 U+° • " U% U• U• UÀ  
 •U•Fó\*T /7 Ö é e Ú \ ŽU• ©0%7©!` Ÿ!ÈUœ  
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 , FU• K Fç" g S , S 3Ī DKj á;- fO~ j a Ā  
 7 9 8 á;- \ Ž+° K '¥ S 3 3K +°,\$ Ÿ S .D-  
 S •66 • Y 5 ”.# -Ý? !Z :6^Fç 3ð8ø ,K

8ø t(Ü & j9f •,\$ ŸUžL1F • 5 5 t.# Q ) ,  
 K !` 2 :6^Fç ,K8ø=”(Ü & j9f •,\$ ŸUž58 T 3  
 !È YU• 5 f-ß ”!Z -Ý? !Z , 5 t.# :6^Fç 3ð  
 8ø ,K8ø Ú\*K'• gFû s t(Ü & j9f •,\$ Ÿ : •  
 66 • ,L1F •,\$! U• K '¥ S : 3!È+° Ÿ5€ Ò < ,  
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 : j e ° K )2 B SBT È fFç" g SU• ü s Ú  
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 \ f+° K , 9=x ü Ç.ý ' É š , œ š [ ½

ø 69 ½)d

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 .POUBJO 4DJFODFU• U• U• UœU• Ÿ  
 U%UUA B;ç ) =) f á•y! K"m]:\*K-µ" Y h ĀFû>ð+°K  
 MĀ !` K -EFŃU• U• U• UœU• Ÿ  
 ;IBP 2 ( 4PNF DPOTJEFSBUJPOT GPS QSFTFOU T  
 BOE FDPMPHZ TFDVSJUJ PG TPVUI \$IJOBU\*O  
 BOE 8BUFS \$POTFSWBUJPOU• U• U• UœU• Ÿ  
 U%UUA !-EÒ/\_0uU•(•ø ½U•0u 3Ī á;- fO~ j a Ā 7 9=x¥  
 -:K á;- \ +° Ÿ2' Y)!` K -ý'U• U• U• UœU•  
 Ÿ  
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 WFHFUBUJPO BOE TPJM FSPTJPO VOEF S 1JO  
 SFE TPJM SFHJPO PG TPVUIFSO \$IJOBU\*O \$IJ  
 8BUFS \$POTFSWBUJPOU• U• U• UœU• Ÿ  
 U%UUA \$BP -U•-JBOH :U•8BOH :U•FU BM 3VOPGG BO  
 NBTTPOJBOB GPSFTU JO TPVUIFSO \$IJOB BGU  
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 U%UUA (V ; +U•8V 9 9U•8BOH 9 -U•FU BM 6TJOH MJWF  
 UP BOBMZ[F UIF FGGFDUT PG QMPU 1JOVT M  
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 7 9=x Ž 9K|b | :eEL -[ !` K -EFŃU• U•  
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 )F 4 +U•9JF + 4U•;IPV : 9U•FU BM -JNJUJOH GBDUPS  
 UFDIOJRVFT GPS VOEF SHSPXUI SFTUPSBUJPO  
 SFE TPJM BISSFB \$IGOBVUW \$IJOFTFUœ #VMMFU  
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;IBP 3 %U•'BO + #U•)F : 2U•FU BM &GGFDW%P GÁT M̄BQ KQF T d-10/20 POU•ÉF&tjU•  
TPJM QIZTJDPDIFNJDBM QSPQFSUJFTU•FO[ZNF BDUJWJUZ BOE ZENR JDSBOEJ BMT NFUIPEPMF  
QSPQFSUJFT JO 1JOVT NBTTPOJBOB QMBOUB#UJFJOUHUO HSJDVMUVS F&DSFM PUA Z  
BOE &OWJSPONFOUBM 4DJFODFTU• U• U%UCEU• Y).ŷ'Kž f Ø K -@/ç|Ú\*K•Ð K Ú\*K•-@/ç"  
U%U•UÀ B;!%o HU•\$, )U•• )U•0u Ā2 ò Ò %O~jª Ā7K CØU•ŷ' &tjU•  
§2öFç"gs+•ù K U• U• U• UCEU• ŷ %FQBSUNFOU PG .JDSPCJPMPHZU•\*OTUJUUVUF P  
;IBP 3 %U•'BO + #U•)F : 2U•FU BM 4PJM FO[ZNF "BDBEFWJUZ FTGBØE JFODFT 4PJM NJDSPCJB  
NJDSPCJBM QSPQFSUJFT JO 1JOVT NBTTPOSIBOBTGUMBØ#FBKJOUF4BØFØD6GSSFFUW  
QBSFOU SPDL BSFBTU•\*O \$IJOFTFUCE 4PJM UÀ UGBŽU•UCEU•Dª rU•0u SðKDK;f98K\U•T\*  
K !'2%œ7ž Ÿ5€ Ò \*K-'ÑU• U• U• UCEU• ŷ  
U%UœUÀ /KU•]#1.ŷU•Bj-ö-öU•0u &°34, (\*4+°SðKDK;ÉŸ ;IBOH # :U•9V 9 9U•-JV 8 ;U•FU BM (SFZ SFMBUJPO  
f'q;É á;-\\Ž¥-@/ç ÉF /7'ÑU• U• U• UCEU• TPJM NPJTUVSF VOEFS EJGGFSFOU MBOEVTF  
ŷ \$IJOFTFUCE "DUB &DMPHJDB 4JOJDBU• U• U• U  
2JO 8U•;IV 2 ,U•;IBP - -U•FU BM 5PQPHSBQJ DUÀ (F SUB-D)UF;SöUWUD T•-\$•989=x Ž9M;%  
PG FQIFNFSBM HVMMZ FSPTJPO JO MPFTT IJMN Z+B•QFŷH\*%M-MZ-H-SF#8PØ•CBTFE PO  
34 BOE (\*4U•\*O \$IJOFTFUCE 5SBOTBDUJPOT PG)U•NE•\$IJOFU•FUCEØDJF UZ PG  
"HSJDVMUVSBM &OHJOFFSJOHU• U• U• UCEU•8BOH 4 :U•4IJ :U•/JV + +U•FU BM \*OGMVFODF PG WF  
U% UÀ 'MPSJOTLZ \* 7 %JHJUBM UFSSBJO BOBMZTNPEFOIT P•CMT PDMFOVDUSBCEUHFQ DPBM HBOHVF C  
1VTIDIJOPU•3VTTJBU•"DBEJNJD 1SFTTU• U• ŷ HBOHVF QJMF JO )FEPOHU•4IBOYJU•\*O \$IJOFTFU  
U% UÀ %VCBZBI 3U•-PFDIFM 4 .PEFMJOH UPQPHSBQ4JOJDBMBS SBUEJBUWPOŷ VTJOH  
(0&4 EBUB +PVSOBM PG "QQMJFE .FUBP ASØM PHZUŠ É UD Uŷ)ØEUMK š ©=x -[>ð/7  
ŷ CØU•ÉF&tjU•  
U% UÀ F :7U•" .ŷU•(-Q± Y)g>-!;-π•fá;-\\Ž¥ /BUJPOBM TPJM TVSWFZ PGGJDF 5IF QSPWJTJPO  
-2% ÉF /7'ÑU• U• U• UCEU• ŷ TFDPOE TPJM DFOTVTU•\*O \$IJOFTFUCE #FJKJO  
(VP . )U•:BOH 2 ,U•8BOH \$ . "OBMZTJT PO FSPTJPOBM UFSSBJO  
DIBSBDUFSJTUJDT PG UZQJDBM TBN QM FUÀ J•œN•B JØ XØBŪFØ~P ŠARKq:ESØK KHÚ\*KO  
PG \$IJOBU•\*O \$IJOFTFUCE 5SBOTBDUJPOT P'GFUg Sö\$2KOFY f ĀFRB\$F'Uŷ PGU•  
"HSJDVMUVSBM &OHJOFFSJOHU• U• U• UCEU• ŷU• UCEU• ŷ  
U% UÀ Yzæ! = •,)!' UF K á;-21§23Ó3òU•4- U• .FJ +U•;IPV ( : 4UVEZ PG SIJ[PTQIFSF BOE C  
CØU•Y)! U!'a&tjU• NJDSPCJBMU•FO[ZNF BDUJWJUZ BOE OVUSJFOU  
.JOJTUSZ PG 8BUFS 3FTPVSDFDFT PG UIF 1FPQWIGGF\$FOUCTMUBDØPØHFTQBOVT NBTTPOJBOB G  
4UBOEBSSET GPS DMBTTJGJDBUJPO BOE HSBERGJFO P SBTP JNR VSPOTØPØVFS TJUZ PG 'PSFTUSZ  
U•\*O \$IJOFTFUCE #FJKJOHU•\$IJOB 8BUFS 1PUXUSEU•S fYTTU•  
U% UÀ 9V 9 -U•.B ,U•'V # +U•FU BM 3FMBUJPOU•QATC4FDU•FO-UWFBUEU•BW JFOE& R•K =.ù æ 3Ū Ā  
BOE TPJM BOE UPQPHSBQIZ JO B ESZ XBSN#SØ ŷIF SÚ\*W•BØMŷZU•ĀT•K•'ŷØB U•  
\$BUFOBU• U• U• UCEU• ŷ U• UCEU• ŷ  
U% UÀ Q•@• K ÉFB'2¼ă" CØU•Y)ÉF.ŷ~&tjU• -VP %U•4IJ ; :U•5BOH + \$U•FU BM 4PJM NJDSP  
.jU• TUSVDUVSF PG NPOPDVMUVSF BOE NJYFE QME  
-V 3 , "OBMJUJDBM NFUIPET GPS TPJM BOE FJHSP JDI FTNVTUW SZUCØPQJDBM \$IJOBU•\*O \$I

PG "QQMJFE & DPMPHZU• U• U• UCEU• ÿ )VBOH : -U•\$IFO - %U•'V # +U•FU BM 4QBUJBM QB  
 U% UÀ L%o., HCπ.SýKf"m á;- ,µ/ %K BTFù+°•ù BOE JUT JOGMVFODJOH GBDUPST HVMMZ DB  
 >« µU•K>« 48/S'U• \$IJOFTFUCE +PVSOBM PG /BUVSBM 3FTPVSDFT  
 ;IBOH 9 \$ &GGFDUT PG TPJM FSPTJPO EFQPTJUJPO PO TPJM RVBMJUJ JO UIF  
 UZQJDBM CMBDL TPJM BSFB PG OPSUIFBTU \$IJOBUC\*O \$IJOFTFUCE 9J BOU•  
 4IBBOYJ /PSNBM 6OJWFSTJUJZU• UIF EJTUSJCVUJPO PG TVSGBDF TPJM XBUFS  
 U% UÀ (-"V œU•z Ö³U• '•U•0u 98K\U\*Tâ;7K \$ HVMMJFT 5SBOTBDUJ POT PG UIF "4"&U• U• U  
 2+°2/öç :K MÃ1%3ð <ÿ2' !'K -'ÑU• U• U% UÀ E3PU•F HU•±[œU•0u SðKP Ê;"m K áFùö!  
 U• UCEU• ÿ U• U• UCEU• ÿ  
 -JBO (U•(VP 9 %U•'V # +U•FU BM 4QBUJBM W  
 8BOH ) +U•-JV 9 8U•4IJ 9 ;U•FU BM %JTUSJCVUJPO EFQPTJUJPO XBUFS JO B TNBMM DBUD  
 VOEFS EJGGFSFOU MBOE VTF BOE SFMBUJPO QTIJQ TFOUX FBOBT & DPMPHZU• SFBUJBOE U• U  
 TPJM HSBOVMF DPNQPTUJPOU•\*O \$IJOFTFUCE +PVSOBM PG /BUVSBM 3FTPVSDFT U• U  
 \$POTFSWBUJPOU• U• U• UCEU• ÿ U• \*K•K•Fù B öç Ó b 2L-@/ç K 'ÑU• U•  
 U% UÀ -=H"ÉU•(-rÖÉU•Kt OU•0u 3Î ;"m 98U\*Tâ;!Z.# U• UCEU• ÿ  
 "m]¥--@/ç \*K-'ÑU• U• U• UCEU• ÿ 8BOH ) -U•#J - %U•;IBOH # \$IBOHF JO NJDSPCJ  
 :VBO % )U•8BOH ; 2U•\$IFO 9U•FU BM -PTTFT PG QIPTQIPSVT VOEFS EJGGFSFOU MBOE VTFN  
 QIPTQIPSVT VOEFS EJGGFSFOU MBOE VTFN QIPTQIPSVT VOEFS EJGGFSFOU MBOE VTFN  
 XBUFSTIFEU•\*O \$IJOFTFUCE "DUB & DPMPHJDB 4JOJDBU• U•  
 U• UCEU• ÿ U% UÀ ?z HCSýKfπ-"m È5\K Ú\*K•33+°/K  
 U% UÀ "7É9U•DÉ oU• 2LzU•0u K á;-Dó/7Y+° §2 øKò B¥--@/ç "øU•>« CÈÄÿ-S'U•  
 (-@/ç4(E Y)!'K -'ý'U• U• U• UCEU• ÿ :J : " TUVEZ PO UIF TQBUJBM EJTUSJCVUJPO  
 :F ; )U•-JV # :U•'V 4 )U•FU BM 3FWJFX PG SFTFBSDI PO EQSJDNFOU  
 SBUJP PG OVUSJFOU JO TPJM FSPTJPO EFQPTJUJPO UIF UZQJDBM XBUFSTIFE PG CMBDL TPJM SFH  
 BOE 8BUFS \$POTFSWBUJPOU• U• U• UCEU• ÿ /PSUIXFTU "HSJDVMVSF "PSFTU 6OJWFSTJUJ  
 U% UÀ /7tøU• '•U•(-"V œ 3Î DKj f5AnK MÃ1%4+° 2Ž U% UÀ !(µ±U•AN çU•% «" U•0u !;>«E, B3Î æ Fù & ÄK  
 ¥- \)2.ý'U• U• U• UCEU• ÿ Ú\*K•-ß#¼ AN È6)-@/ç K 'ÑU• U• U• UCEU•  
 \$IFOH 9 'U•4IJ 9 ;U•8BOH ) + 'SBDUBM DIBSBDUFSTJÿUJDT PG QBSUJDMF  
 PG BSBCMF MBZFST JO IJMMZ SFHJPO PG SFE TPJM JO +JBOHYJ 1SPWJODFU•\*O \$IJOFTFU  
 (FPHSBQIJDB 4JOJDBU• U• U• UCEU• ÿ NJDSPCF UP DBSCPO TPVSDFT VOEFS SFTTU  
 U% UÀ 5Á %L-U•Ey1µ8µ 6á !' !Á %3ðÈ È á;- !Á MÃ1%3ð <+° SFE TPJM JO +JBOHYJ 1SPWJODFU•\*O \$IJOFTFU  
 •ù " !Á-@/çU• U• U• UCEU• ÿ U• U• UCEU• ÿ  
 9JBP 1 2U•;IFOH ' - &GGFDUT PG VQ TMPQF SVQPGBBFE TFEJNFOU P O S JMM SBT öK  
 FSPTJPO TFEJNFOU QBSUJDMF TJ[F EJTUSJCVUJPOU•\*O \$IJOFTFUCE +PVSOBM PG  
 4FEJNFOU 3FTFBSDIU• U• U• UCEU• ÿ U• K+•u z 1-@/çU• U• U• UCEU• ÿ  
 U% UÀ EÝ~U•±[œU•(-çU•0u SðKDKi;"m K !'2"/! )V \$ +U•-JV ( )U•(VP -U•FU BM &GGFDUT PG TP  
 2.: (Û~ÿ2+° œFù 2¼ \*K-'ÑU• U• U• UCEU• QIZTJDPDIFNJDBM QSPQFSUJFT BOE TPJM NJ  
 ÿ "SJE ;POF 3FTFBSDIU• U• U• UCEU• ÿ  
 2JV :U•'V # +U•8BOH +U•FU BM 2VBOUJUBUJWF BOBMTJTP PG SFMBUJPO TIJQT U% UÀ %FTTBMEHO %U•#FZFOF 4U•3BN /U•FU BM &G  
 CFUXFFO TQBUJBM BOE UFNQPSBM WBSJBUJPO PG VTFJMNTPJMVSPDPOTUJBE BMPOH  
 FOWJSPONFOUBM GBDUPST BU B HVMMZ DBUDNFOUFGOIFPPOTBMBUJBOU•O U• U• UCEU•  
 \$IJOFTFUCE "DUB & DPMPHJDB 4JOJDBU• U• U% UÀ UCEB-WJFT , 8U•#BUFT + %U•JMMFS 3 ' &OWJSP  
 U% UÀ Sð•TÁU•Kt UMçU•±[œU•0u SðKDKi;"m K !'2 SFMBUJPO TIJQT PG UIF "SUFNJTJB USJEFOUB  
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# Effects of Erosional Landform on Soil Properties under *Pinus massoniana* Forest

8 " / ( # BOHX9F 9 JBPW 6 Q + JBO

U: Anhui Province Key Laboratory of Water Conservancy and Water ResourcesU•Anhui & Huaihe River Institute of Hydraulic ResearchU•Hefei

UChinaUCE

U: Key Laboratory of Soil Erosion and PreventionU•Jiangxi Institute of Soil and Water ConversationU•Nanchang

UChinaUCE

**Abstract** 5IF LOPXMF EGFSPUG FQSBOE EJTUSJCVUJ POT PG TPJMT JT FTTFOU MBOE VTF BOE QSFWFOUJOH EFHSBEBUJPO. OnabS Gialka E MBEFTEUJXFJDI BSBMMU EFHSBEFE MBOE MFBP \$ FEO BSFBT PG 4PVUIE SUO \$ B \$ O BU \$ U BDFJ O E E PG UIF JT BO JNQPSUBOU NBUFSJBM CBTJT GPS WFHFUBUJPO HSPXUI BOE JUT FSPTJPO 5IF Pinus massoniana E GPS FTU JO UIF IJMMZ SFE TPJM BSFB PG 4PVUI \$IJ NBLJOH-BOFWBSPONFOU UIFSFJO WFSZ GSBHJMF \*U JTU•UIFSFGPSFU•PG HSFIBBCJMJUBUJPO JO TVDI BSFBTU•UP EFUFSNJOF JNQBDUT PG FSPTJPOBM FOEU•UIJT TUVEZ BOBMZ[FE FGGFDUT PG FSPT Pinus massoniana E GPS FTU JO UIF IJMMZ U: ° Uá ° 7U ° Uá ° &UCEJO (BOYJBO \$ PVOUZ PG +JBOHYJ 1SPWJODFU•\$IJ JT MBUFSJUF EFSJWFE GSPN HSBOJUF XJUI UIF GFBUVSFE PG B DBMDBS PG TJMUU•BOE PG DMBZUCE -PDBUFE VOEFS UIF TVCUSPQJDBM IJMMZ QSF DJQJUBUJPO PG BCPVU NN DPODFOUSBUFE NBJOMZ JO UIF SBJO PVU EVSJOH E HFCUJH BOE URCE\$ 'PVS IJMMT XFSF TFMFDUFE UZQJDBI TBEEMF BOE HVMMZ PG FBDI IJMMU•B CFMU USBOTFDU XBT MBE PVU BU S B TBNQMF QMPUU: Nf NUCEXBT EFMJOFBUFE TFQBSBUFMZU•NBLJOH VQ B BT DPOTJTUFOU BT QPTTJCMF JO TBNQMJOH DPOEJUJPOU•JU NVTU CF NBE 4PJM WPMVNFUSJD XBUFS DPOUFOUU: 48\$UCE PG B TBNQMF QMPU XBT EFUF SBOEPN TBNQMJOH QPJOUT BDSPTT JUT UPQTPJM MBZFSU: Uá DNUCEXJUI 5 UIF TPJM TBNQMF PG B TBNQMF DMPUJF D BTF B NSFN WSJF RUC QTPM TGLBZMS BU DPMMFDUJPOU•UIF TPJM TBNQMFT XFSF TJFWFEU•TFQBSBUFMZU•UP SFNPWF TJFWFU•BOE UIFO EJWJEFE JOUP UXP QPSUJ POTU•P \$ JF E U P S E E T J F W F E J D H B SFBEZ GPS BOBMZTJT PG TPJM UFYUVSFU•FO[ZNFU•FEBQIPO BOE DIFNJDBI FBDI TPJM TBNQMF IBE UISFF SFQMJDBUFT JO BOBMZTJT BOE UIFO NFBOT XFSF QFSGPSNFE PG UIF EBUB PCUBJOFE JO UIF BOBMZTJT XJUI UIF B GPMPXJOH DPODMVTJ POT Kimsa E Saba G PSUJF UIF WBSMFVOTEHS TPJM QSPQFSUJFT \$PNQBSFE XJUI UIF TPJMT PO UIF SJEHF BOE TBEEMF TPJM QSPQFSUZ JOEJDFTU•JO OVNCFS PG TPJM NJDSPCFT BOE JO TPJM FO DIFNJDBM QSPQFSUJFT BMTF WBSJFE TIBSQMZ XJUI FSPTJPOBM MBOEGPS UIF TPJM JO UIF HVMMZ IBE NPSF TPJM QIZTJDBM BOE DIFNJDBM QSPQFSU

TPJM FO[ZNF BDUJWJUZU•BOE UIF SFMBUJ POTIJQ CFUXFFO TPJM QSPQFS  
UCE5IF NFJOWBSPONFOU GPSNFE JO HVMMJFT JNQSPWFE TPJM QSPQFSUJF  
PG WFHFUBUJPO 5IFSFGPSFU•UIF TUVEZ PO FOWJSPONFOU PG FSPTJPOE  
PG TPJM BOE WFHFUBUJPO JO OBF IJMMZ SFE TPJM BSFBT PG TPVUI \$IJ

Key words 4 P J MUŽ & SPT J P O B M U S S B G D S U Z T U U Ž ) J M M Z S F E T P J M S F H J P O

(责任编辑: 陈荣府)

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