

& 855, & 8/80 9,7\$

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<RXQJ ( 2 DQG ' 6 5 5 V D Q G O D E R U O F S I Q R W S K R U R Q V F B V L Q I O  
ULSDULDQ EXIINU -VR QY LSURRS H U M B I C H M H G

9LOODUV 7 ' 6 % % B V O H \ D Q G ) R U X U R V R I D O 9 R U O R Q W P R X Q W  
R Q H W K L U G R I V R K I G Z B V O Q Q 1 0 V R L H O D M B K I S O R W H 6 R U L O V + R U I  
G R L V K

,VKHH ( 5 ' 6 5 R W V 5 6 % D R X U J D X O W 3 & B V \$ R B G X V F R Q W U  
IURP HURGLQJ VWUHDPE D Q N V R L O V R I - 9 H Q P R O R V Q I V 4 X D D N H  
G R L M H T

5RVV ' 6 6 : % D I L Q H V 5 ' & % U U \ \* - ) U H G Q D M Q G H Q & / \* R R G  
3 : + D J O H W W 3 5 - R + K Q L Q R H Q & ( 7 / D U Q R H Q 5 \* . % . R D X I D H 5  
2 X L P H W ' 3 D U p & ' ' 5 6 K F K U P H H W 5 \$ ; Q W E H U O D E R U D W R U \  
L Q W K H F K H P L F D O D R Q U H O W L V R R I O D U F H F G A L D O H A Q Ö R R V G E P S O p A p €



3 DUGR / + 3 + 7 HPSOHU & / \* RBQDOH%6 \$GDPV 33 0% RU

5RVV ' 6 5 - 5% DUDWGRMWDQG \* - ):DQZ/ISDWK VWXGLHV LQ  
ZDWHUVKHGV RI KUHLDGZ BW%U XVWKLZ BWRIU 5HURPXLQ W5HV.

5RVV ' 6 7 5 :LOPRW DQG - /DUYKHQRLOVRIMVDPVWVWYQVWRU  
DQG GU\LQJ &RPBQQWR\$QDQFL

5RVV ' 6 &RPRIQWXROQDWRIOFVHPVXVUXULQHVKHQWLYH  
+\IGUDQQGHSWV 6RLO 6FL 6RF \$P -

5RVV ' 6 DQG 5 - %D,URQDFWWUIDQULVWKWHIDHFGVFDRAQLRQV OH  
IRUHVW IORBU6FRU6RF \$RL -

+XQWHU ' DQG ' 6 5RVV (YLRG[HDFHXPRQXDPSSKRWVWBI  
RUJDQLF VRLQFKRIRQIFHRQV

5RVV ' 6 5 - Q%DU5WQDWDGRID OH(FDKVILQRJQVDEQG WKH S+  
LQGHSHQGHQW GRQVHUEKEXWJHRQDRSDRFDWLRHVDLQRGSRGVRIG  
ZDWHUVKHG ,Q 5% DOLLJDKW DQ 5 3 QXDPDQQRHGLVQW  
DW ORZ S+ SS .OXZHU \$FDGGRVLF 3XEOLVKHUV W

5RVV ' 6 DQG 5 - %DUWOHWW KRGV DIQIFWDPBDH[VWVDEWJ  
SURSHUWLHV RI VROXWLRQV REWOLYHQIURXPDORUHVWHG

%DUWOHWW 5 - DQG ' 6 5RVV RI R&RQRJDEPHWULFEQVW  
VROXWLRQV 6RLO 6FL \$P -

%DUWOHWW 5Q-G)'56 05DJGRID LQHSVLEPMSIDHWRIQIDDFWLY  
DOXPLQXP LQ VRLO VROXWLRQV 6RLO 6FL 6RF \$P -

0DJGRII ) 5 5 - %DUWOHWW DQGHUI6Q5DQV DFLGL6RFLDWS  
VRLOV 6RLO 6FL 6RF \$P -

5RVV ' 6 5 - %BUVDJGRM DQG ]RQVRIUBDQDQWQXP LQ IRUH  
OHDFKDW \$WRPLF 6SHFWURVRS\

0DJGRII ) 5 ' 5RVV DQG - \$PDQRURJHQ \$YDRLODMLHOLWV  
6FL 6RF \$P -

0XUSK\ : 0 ' 7 'XJGDOH DQG ' 6 \$RNLFWLQJ3QRJEXPHVH  
QHHGV LQ VWHHSODQGSZVWVWRILQSRVWVFL&3RDPQV \$C

0XUSK\ : 0 ' 7 'XJGDOH DQG ' 6 Q5RQVPH SHOQHWWHLOVJHH  
UHTXLUHPHQWV RI ZKLWH FORYHU IRU LPSURYLQJ SHUP

3XEOLFDWLRQV ERRN FKDSWHU

'UL]R \$ 6HLW] ( 7ZRKLJ ( :HEHU ' 7%IUQR O6H B Q G H5JRM  
LQ SKRVSKRUXV UHPRY B Q EVMFURXDEG EICILZNDM RI DHUDWLRQ  
JURZLQJ VHDVR.Qn 9SPSD]DO - HG WDJVDMZPDHWHU SODQW  
DQG PDQDJHPHQW LQ FRQVWUXFWHEG DQGLQJ DWXUDO ZHV  
%DUWOHWW 5 - DQGHGR[5RVRFHVVHVInLQ/VRSO USS HG



+RVNLQV % DQG ' 6 5RVV 6VWRSQH SGLPMD DQWLSR Q RD  
HG 5HFRPPHQGHGHGRUOH W HRUW WOLJ SURRLEW KW D WMM U QQ G  
1RUWKHDVWHU QD 5HLRQR QBO 3XE8QLFYH VRI 'HODZDUH 3U

\*ULIILQ \* : ( -R6H5RDVVDQG ' 5HEPQEHVQGHVHVR MLPWWV  
DQG \$ :ROI HG 5HGRPPVWQGG SURRLEW KW D WMM U QQ G  
QG HG 1RUWKHDXVWHLFDVHHRQRQRD DZDLRQ 13YHRM'HO

\*UDQWV 5HFHLYHG

5RVV ' 6 + 0 'DUE\ 6 ( +XUOH\ -&: \$GNDUNWQUG \$ 7 5RDV  
\$FTXLVLWLRQ RI DQ QW 3 2V6HURIWDL DLW\ 86'\$ \$)5,

)DXONQHU - : ' 6 : 5URNVDDQ GP.SURYD QG IRXJU RX QGHWUHWU F W L  
EHWZHHQ %03V WLOH GUDLQDJH IDEB 3XQRMVHADN R VX  
&KDPSODLQ 6HD \*UDQW

:HPSOH % 5 'LHQR G. DQGG'HUZR VV (SYDDLQD SRW JH QWRDQ IRU  
DQG QXWULHQW UHWHRQDLRUDPHZRHUNR VFKDPSLOV DL QQ% D  
SODQQLQJ /DNHLQK DPSODLQ %DV

5RVV ' 6 DQG - : )DXONQHU (TXGSPHLDQD JIR WSKBV S&RODM  
\$JULFXOWXUHHHQWHDQWRQ 6

5RVV ' 6 3KRVS KRSLXFLBMSIRQVIDBBLWFXOWBUIDDQWRBOWTV  
/DNH &KDPSODLQ +D DFKQ 86

5RVV ' 6 DQG 6 : %DLOH\ ZLWK . HLF\*IXU RH 9% U \$MQLDK PHB  
&ROODERUDWLDW HUVH DZDHWKHWVWQWFDLQ\]RQH DUFKLWH  
JODFLDWHG FDFW KIPSHW D W XG)H/R R7F KIRDRVWU\ DQG \*HR  
890 9LUKLQLD 7HF

5RVV ' 6 % & :HPSGLDOR 9 BKRR BKIRWXIW MFSR D DWHUUVKH  
0LVVLVTXRL %DVUQ&HQB\*H: DWH

9DQ +RXWHQ HW DO DFN (36&RFL5V, VLRQLQD% B V&KDPSV DLOLHQ  
([WUHPH (YHQW 8) 235(\$ZDUG 0

5RVV ' 6 % & :HPSDQHG ↑ 3DNERXUVQL04 \$ QRWSKRLQXV FRQF  
DQG VWUHDP ORDGV LQ IRUHVVHGVZDRW HZDVKHG VT RD QH  
SURWHFWLRQ 1RH D W K F K Q R R V S C H W H D W B M H 7 K H P H

)DXONQHU - : 'ZBBWK 6 %RUVE\ LOO&DUVHHYL V-LRQ RI WKH  
3KRVS KRUXV , QGH[ IHRQW, POSUDQDYJHICPHIQWDLQ G 8D \$ H15 &6 D  
9HUPRQW &RQVHUYDWLRQ , QQRVDWLRQ \*UDQW

5RVV ' 6 2UJDQLFQSKRVS B W U R Q W W U D D V W U F H D P W F X R U D U L G R L O V  
9HUPRQWTV /DNH &KDPSODLQ %DVLQ 86'\$ +DWFK

'ULVFROO & 7 - '5RHV/HUV%' 6KDQXHHUDQ\$V\$HV6LQJ ELROR  
PHUFXU\ KRWVSRWVHEQ RRRQWKBIQH HFRUWVKOM URQU 6W DWHV  
5HVHDFK & KRSHUDWLYH 7

5RVV ' 6 DQG % & :HPSOH 2UJDQILFUSORWLSRQRUXQ IBNFV  
&KDPSODLQ VWUHDHFRFURQLGRDWRULQVHQWHU 86\*6

5RVV ' 6 - + \*|DQNW \$ @ :LOPRWEDQG &(DUWK&ZRJUP DQG  
OHJDF\ HIIHFWV RQREQHQZWKRXPDQDQW/ QIRUWKHUUQIBW  
5HVHDFK & KRSHUDWLYH 7

:HPSOH % & DQG ' 6 5RVV (YDOXSDWHLQHGHWIDHFWRLQFRQHVV  
WR UHGXFH VHGLPHXQRIDQG\$KRRQWRSDXVHWDQGHQWHU  
\$15

9DQ +RXWHQ - DQQRQ & RXFQ\$GPDSDWHDWHL&KJPSQDWLQH%DVLQ  
XQGHUVWDQGLQJ WWHVFXJRFRHPSLQHJ 06) (36&R5  
5RVV LV RQH RI WKH IXQGHG LQYHVWLJDWRUV

5RVV ' 6 &DUERQ DQFG/ QXWUHLFRDQDQURULFXQW&UDO VRL  
+DWFK

5RVV ' 6 'HWHUPLQHQHSDKRVSRVQWMDUHDUREDQNRGIGLPH  
/DNH &KDPSODLQ %D9HLQPRIQVHUPVQW &HQWHU 86\*6

0F\*XLUH . - 6 : %DLQOHQ7D'QG ' 6UD5RLVYH 58R/ODDERK /DQG  
FRQWUROV RQ K\GURQ\$JLGRJHRZSLDWKHWISQVILQ/DOXGWHI  
IURP SHGRQ WR FDWFKPHQW VFDOHV 890) +\GURORJ\

:HPSOH % & / 0RUULVVH\ ' 0 5LRJRG 'GUD5RQVJH \$P\$HFWLV  
&KDPSODLQ ZDWHUDP\$DOLQ\%DQNG 3UKRJUDP

6HEHVW\HQ 6 ' '% 5RQVQOHQ \$ WXIULVFRVRRSCLWVIB GHWHFV  
QLWUDWH LQSXWZDWRHUVWRHIDRUDHQAHVLEDDQRHUWKHIGWWH  
1RUWKHUQ 6W&RRS\$5UDWVDF 7KHPH

\*LONHU 5 ( ' 5R\$V0DWVWVHVV BQGD-VLQRJOFEDUEQR VHTXH  
9HUPRQW SDVWXUYHDWBRQ\$ ,QRQRVHDUVLRQ \*UDQW ± 9HUPR

5RVV ' 6 DQG - -XLOOHUDW 0HUFXU\ OLWVWHUIDOO GHSR  
LQ`0@ q fpND@PD 0000@ UELVLYSHVIFP1€€€€@ 0p Ap €PR €U€ Ap Q0`P9P

5 R V V ' 6 4 X D Q W L I V L Q J H F ~~Ø~~ H E W Q D V B P Q H S D F W H L Q W W D Q Q 9 H U P  
86 '\$ + D W F K



5RVV ' 6 6RLO PD Q J D Q D W H R R Q I D Q F Q W H W H Q D W L W Q P R W B O V D Q  
86'\$ +DWFK

'H+D\HV ' + DQGV7 '\$ F3LHJ K L H S R V L W H V R Q H H R H F W W H P Q I I R Q 9 H U  
(3\$ &RRS VXEDZDUG WR FR3, ' 6 5RVV

5RVV ' 6 DQG \$ /LQL 0LFURELDORD Q G V S U K R V H I Q R P R K E H L P L L F W D C  
HFRV\VWHPV 86'\$ 15,

5RVV ' 6 DQG \$ /LQL \$ V V H V V L Q J H P S L R W U W R J I Q Q W Z B D F R V Q W W P D  
IRUHVWHG ZDWHUVKHGV 9HUPRQW J(3 B Q W F D I 6 ) D Q G H O O F  
UHQHZDO

/LQL \$ DQG ' 6 5 R V R I W K X L S P H Q Q Y E O R Q P R Q W R B B A D E R U D W F  
890 5\$&

5RVV ' 6 \$ V V H V V L V S J R Q W D L R G H Q U W O Z B I G F U R Q D W U L D R Q W L Q Q Z D W H  
890 +DWFK

5RVV ' 6 DQG \$ /LQL 0HWKRG G O I W O R I S F B O W R I Q U W W R G Q H  
8&56

5RVV ' 6 DQG 5 - L % D W W P O I H W V B D O G E & U H D O W Z H V O A D R U H G R [ L  
LQ WKH GDUN 890 +DWFK

5RVV ' 6 3 6 . L F Q G H V M E B W N R \ 6 : 6 - R N D I O S H U + : ( H + D \ H V -  
+R I I P D Q - : + X J K I R Q R \$ F T Q L L Q L G W L F W D V P I D O D W R R S I O H I P L S O /  
V S H F W U R P H W H U 86'\$ 15, & \* 3

5RVV ' 6 5 - % D U W D Q B W M D I Q D W K G H S P H R I P L Q U H V W V R 6 8 O R V X I  
G R I R : U S H U € ` € p „ p v s p e ` d a e ` € 0 @ €

'XVWRQ 6 % ' 6W WDHK P 6. -5 R0VF\* X D 6 6 F %LDHLOEHHU - %HQWRQ  
3HQQLQR & R Q W UDLFELXGWL MR QR B I VRKHQZQDFWR H WIKH FUL  
]RQH 6RLO 6FLHQ FUHL FDR F QMMVU R D \$QHRHQDUR 0 B \$ W-LDQX D6U\

5RVV ' 6 & K B Q H Q V D Q G S I K R V S K R F H X G V E U H V H H S W H D I Q G G U L S D  
IORRGLQJ IURP K H D G Q D W M H U P V R W R / W N K H H S P K D P H S O G I L Q J 1 D H Z  
+DPSVKLUH \$ V V R F L O D W H L R R X R I F H D 6 / F X H G W H Q W V \$ C R O X F R O J & I  
-DQXDU\

5RVV ' 6 %DLOH\ 9 \$ L O A X D L Q W D 6 Q D X O P R O V D Q G 7 U H Q G V " L G  
H [ F K D Q J H D E O H F H M Q L R H O U D I W O B W R I R O W O R P U L Q J V W X G \ ) R  
( F R V \ V W H P 0 R Q L W R I U \$ L Q Q X 8 D R R S H H D W W Q Y ' H / F X U P E I H O J W R Q 9

%RZHU - ' 6 5RVV. -6 0 F % X L L O H H % ' ( 6 6 F U K D I K I R E B U . \$ V K H  
%HQWRQ DQG 6 'XVWRQ P L Q H U A X O D Q W W V O K H W H L O D O D B U D G I  
XVLQJ D ZKROH U K H S P O H L W L K D D S S H R S S K W L G D O H H W L R Q \$ Q Q  
: D V K L Q J W R Q ' & ' H F H P E H U

%HQWRQ - 0 ( 6 F K U H L E H U . - 0 F \* X L U H % D L O H 6 W - U D K P Z H U 6  
'XVWRQ & K D U D F W H U L J L Q J V X E V B U I O B F L K \ G H U C Z R J W L  
\$ P H U L F D Q \* H R S K \ V L F D O H W Q Q R Q : \$ Q Q X O H O V R I Q U ' & ' H F

5RVV ' 6 %DLOH\ 7 9 L O O D U V O P R A X L Q Q G Q D ' X - Q 6 B Q Q O H \  
\ H D U V L Q W R D L W R D U Q J R V W X P R Q 1 H R V W W 1 6 \$ P O H W L F R O Q H I R H C  
4 X H E H F & \$ - X Q H

5RVV 9 6 / 3 H U L Q Q R : H P S O H K H S R W H Q E W W L Q F R Q W M U H D P E D  
S K R V S K R U X V O R D P S O D L Q K % H D / D L N H & K W O K L D V L R / F X R I R Q L W H  
/ D N H & K D P S O D L Q % X R U O I H O J H V F Q 9 7 - D Q X D U \

/ D Q F H O O R W W L % V L D N R & V \$ G D 3 L U H 6 F K B R W C U L D O 4 \$ X D Q W L I \ L G  
S K R V S K R U X V L Q Q V R X I O W U R / I L L I S O X U H L O D E Q G X V B L S U H D F W L V H V  
\$ P H U L F D Q \* H R S K \ V L F D O 8 Q L R Q 1 H Z 2 U O H D Q V / \$ ' H F H I

5RVV ' 6 - 6 K D Q Q H 4 X 6 Q W 7 D D - P 0 ` 0 V p † C R Q t 0 0 @ 0  
U Q D W L R Q D O 0 ` • € € ` 8 0

5RVV ' 6 - \*RUUHV 0 .QRZOHVLQO&BDEML08 'BQNLVPRW  
VWRFNV LQ 9HUPRQW W FBRSDHQC LQWURSHFWMLRQVRIOVRL  
KLVWRU\ DQG HDUWQZRUGRVLHWR L R B\$FHWLLQFDV DQQRKBDL  
1RYHPEHU

.ODLEHU / % ( 2PHRXQJ\*6LIJUDKVDQG ' 6,PSDFWV RI DJUL  
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/DZUHQFH \* % 0 5 \$DQWLEGRQPRHXU )HUQDQGWJW 6,: %DLO  
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3HULOR 9 / & %DOOLQJ ' 6 5RVLDOGR% :HBSOH DVH LQ  
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6RFLHW\ RI \$PHULFD DQQXDO PHHWLQJV 3KRHQL[ \$=

5RVV ' 6 - \*RUUHV 0 .QRZOHV QN&RJELOOH6PLOWRWP  
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(&\$186\$ %XUOLQJWRQ 97 2FWREHU

5RVV ' 6 (DUQKZRUPOHQ GFOERIQHLFQW WRHQ IRDUH VW VRL  
9HUPRQW 7KH 1DUWLMRWUW &BWXIUDHIFOHG 0\$ \$SWLQ

8QGHUZRRG . / & \$OYHV ' 6 5RVVLJQR 'HZRR,ONOXHDFG  
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%DLOH\ 6 : . - 0F\*XLUH DQG ' 6 5RHWK HG HFRVMVQJH W KH  
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\$\*8 \$QQXDO 0HHWIEQVFRDQ\$)UDHFHPEHU

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%DLOH\ 6 : DQG ' 6 5RVV &RQQ6FWDRQZHDQ6HJDSQJ  
ELRORJ\ LQ IRUHVWKH ZRWMWKVHDSVHDEB6\$RFL6RWO R6I \$F  
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3HULOR 9 / & %DOOLQJ ' 6 5RVVIDFLQD%J &FKDRUSDFWHUL  
RUJDQLF SKRVSKRQV DQV6FLWK/HLQ6M6EVRTQWR L86\$YHU6RLQ  
6FLHQFH 6RFLHW\ RPH\$PHLLQFD DQQXDO6\$P6EHLV 01 1R

5RVV ' 6 ( 5 ,DKLHH\ .DQG\* 5 5 %R3KURVDSIORUXV FRQWULEXV  
HURGLQJ VWUHDPEQVNVVBNQIV&KIDPISLQDRL%DFHLGRFRLHW  
\$PHULFD DQQXDQPHHSRLQJW 01 1RYHPEHU

%DLOH\ 6 : DQG ' 6 5RVV 7KULLQVKIROGODLQDPWQIGUDDO  
WKH QRUWKHDVWHHQBUBIS & RBUHGRHQ 5HVRQ FHDWFKPHQW  
,QWHUDFWLRQV BRJ\GLRGRHRFR%HRLLVWU\ -XQZ /RQGRQ

.QRZOHV 0 ( ' 6 \*FRUWHVQGG - (DQVHKZQUPRSHUWVWUQLPSDF  
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5RVV ' 6 5RRNUWHQVDEJ R\EURSHZKOSRWBRGLDIRUPI  
ZHDWKHULQJ LQXSODDQGGQDFVFKPHUWVRLVHSDQDQ0  
)HEUXDU\

5RVV ' 6 7ZHDWWKRQDU XSGQRVQVXQQLWRUPRQW OR  
&RRSHUDWLYH DQQXDO PHHWLQJ %XUOLQJWRQ 97 'HI

<RXQJ ( 2 ' 6 5RVWLDQVG % + ([SXBFSIDEOXIVVRRLOFHQWU  
GHHUPLQHG E\ PRUE SDWFHGRXUWVHQB, &BLOQSORISHU  
6RLO 6FLHQFH 6RFLHW\ RI \$PHULFDYDHPXIDOPHHWLQJV

5RVV ' 6 %DVHG VDDWLRDQWH RQVRLQHV LQ IRLVHWRU\ RI F  
SUREOHPV 6RLO 6\$PHQEFD6BRQKVDORHDFVKLQJRYHREHU

5RVV ' 6 +\GURSEIDRGRVUFRANG &PRHUSKRVOR\JDAI YHUW  
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GLVWULEXWLRQIRUP DQG UHDFKPHLQW\ QHRLQVGHHSQFLH  
RI \$PHULFD DQQXDO PHHWLQJV 7DPSD %D\ 1RYHPEHU

.QRZOHV 0 ( ' 6 \*FRUWHVQGG - (DLRQKZQUPRSHUWVWUQLPSDF  
RQGLVWULEXWLRQRIVRLOFDUEVROHZVWKLQDQDBRVHWVWV  
\$PHULFD DQQXDO PHHWLQJV 7DPSD %D\ 1RYHPEHU

HPRVV RUUKLPpVXV•

0 \* - V ' 6 6FLEHQVWV@HSA@VHUPHOUFVAV



5RVV ' 6 5 %QBXGJJD%OWODH\ F L\GIGORXSHQFRIORQLVRLO P  
GLVWULEXWLRQ IRUP DQG UHDFK\PHQLW\ QRIDGRQHSHSVHLD  
&RQIHUHQFH RQ &DWF\KWHQDWF\FLRQFORRIJ+\GOGORJ\ %L  
\*HRFKHPLVWU\ 1HZ /RQGRQ 1+ -XQH

%RXUJDXOW 5 ' 6 5RVV 6 : %DLDSISURDFKWHK\SHURSDVGR  
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SKRVSKRUXV DYLDQDZROOW\RIQQBQSVKURVLOH6FQHSQFUPBR  
\$PHULFD DQQX&DQFFLQVQDQJLV 2FWREHU

%RXUJDXOW 5 ' 6 .5RVVX16UH%DBL\$H%URXV\GHDRXSHGRORJ\ R  
SRG]ROV DW +XEEDUG %URRN 1+ DRQD60F LPHQFWLQRFL  
&LQFLQQDWL 2FWREHU

%DLOH\ 6 : DQG ' 6 5RVV ZQH GRQDHP IRF VPLQHWDKIDZD  
F\FOH RI QRUKKHUQRKOVGZRBGFKBDQVQVZQJOGQHWD  
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<RXQJ ( 2 ' 6 5RVVNDQO/ % 5 + (QDVKDWBQYDURLDWLRQ ED  
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5RVV ' 6 DQG 6 : %DLOH\ ZQH GRQDHP IRF VPLQHWDKIDZD  
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2FWREHU

5RVV ' 6 'LVVWXZEMQJCSURFIDVFDWHLRQQUVDWLQ IRUHV  
%LRJHRPRQ 1RUWKSURW 0( -XO\

6HEHVW\HQ 6 ' - % 6KDQOH\ ' 6ODRV:(%R\HOLRWW &  
,GHQWLI\LQJ ZKHQ ZKMSKHHUHQIQZKLUWQVQVOSRUWHG WRV  
QLWURJHQ SVVQXWHGJMRSRQW1RQ -XO\

6HEHVW\HQ 6 ' - % 6KDQOH\ ' 6ODRV:(%R\HOLRWW &  
,GHQWLI\LQJ ZKHQ ZKMSKHHUHQIQZKLUWQVQVOSRUWHG WRV  
QLWURJHQ SVVQXWHGJMRSRQW1RQ -XO\ /RXLVY  
. < 0D\

%RXUJDXOW 5 5 DQG ' 6SD5RIVDO LVRYLQVFKLHDMMLVQ\RIQDPD  
ULFK VHHS DUBDRI+XEVBUQK%URRNQ&RHSVHWVWRUQVRIQ  
1+ -XO\

%RXUJDXOW 5 5 %DLDRIVV3\$ : %UDRQVQHDX- -0FJXLUH DQG  
%XOOHQ /DQGIVHQLSFHUVHFDQWL SVRQLQLSDUEFRVQZBHQ

VHFRQGDU\ PHWDOR PLGRNLQR+GJREDV \*RGGWFKHFLGWHUQ  
0RQWUHDO &DQDGD -XQH

:HPSOH % . \*DUYMH\ / \$ORBUFKHQLFN 5RVV]]R DQAGURORJ  
FRQQHFWLYLW\ RIWZRDGNVQDQGVWLPBDFHFDHQRVVDQVIFU  
FKDQQHO PRUSKRORJ\ \*0 +6 666 QLR(XURLSHOOD \*HR  
\$XVWULD \$SULO

5RVV ' 6 - , -XLOOHUDW DQG 0WVH%DDO DQG XSHFXVRL  
DFURVV ILIWHHQVPIVQLCHSHURRQWMIWZ\$QJORDQKFRUHVW  
5HVHDFK 6\PSRVLXP 6RXWK %XUOLQJWRQ 97 'HFHPE

,VKHH ( 5 DQG ' 6 KDRVDFWHUL]LQJHRELVQKRVUXVHIDQEDQN V  
&KLWWHQGHQ &RXQW\ 9HUPRQW + ))UDQ\$\*8\$FQ Q\$D O  
'HFHPEHU

0F\*XLUH . - 6 : %DLOH\ - 3 \*DQQRQ 7 ' %XBDH QPDLQSKR  
DQ LQGLFDWRU VRBIVSQRVLD OHSQVWVHOLYBLQWVUHVKRO S  
\$QQXDO 0HHWLQJ 6DQ )UDQFLVFR &\$ 'HFHPEHU

%XOOHQ 7 ' 6 : %DLOH\ 0.\$- =LP\*PHUV DQG ' 6 'SHWUPLQLQ  
VROXWH VRXUFHVK D Q Q ZD WRHUH V W H Z S H Q W D G Z G W D H Q F F I V Z F L  
&D 6U %D PXOWL WUSD\$F\$QX(BO)0HHWLVR &\$Q 'HFDHPEHU

5RVV ' - -XLOOHUDW DQG 6 :LOPLQW SORWV6RQ QHFDREQV  
PDQDJHG IRUHVWV \$Q Q X D H Q P R H W W L R W R W R Y H L Q % X U R I S Q J  
97 2FWREHU

%RXUJDXOW 5 \ 5RVV\*XLUH DLOH 3 %UR\$XFDWFKPHQW VFD  
K\GURSHGRORJLFDOWDSSURDFKDW RHMVYRQV DQ VFKHQLVW  
+XEEDUG %URRN 1+ \$QQXDO PHHRL\$PHULVFDH 6RQ O 6  
\$QWRQLR 7; 2FWREHU

,VKHH ( DQG ' 5RVV &RQVRQLDXVLD RQR ISRWQWDPREXU  
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6DQ \$QWRQLR 7; 2FWREHU

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7; 2FWREHU

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3ROOXWDQW +DOLID[ 16 -XO\

%RXUJDXOW 5 L'OH\$R D Q G 6. %D\*XLUKIPHQW V\$FDHWK\GURSHG  
DSSURDFK WR XQGGV V L Q D V R G L I Q J H Y D H U L D W D Q & E F E K H U R L % U R

1+ \*RUGRQ 5HVH DUE & D V& R I Q P H Q M Q 6 F H L R Q F H V , Q W H U D F W  
%LRORJ\ DQG \*HRZFKHPRQW(\ -XO\

%XOOHQ 7 6 %DLOFH\XIDUHLBP%UR'X.L5JDXOW DQG  
+\GURSHGRORJ\ UHMLHDXOML R/S DRW LSCOR GHL WWHU/H DRPQWRLOXOW H  
FKHPLFDO DQG LVRWRS LF FOXHV & D W B E R I Q Q 5/H 6 F D H G E K H &  
, QWHUDFWLRQV BRJ\ GURGO RHJRF%HRDQ\W-XO\HZLVWRQ

5RVV ' 6 - ,DQXGL 6 OHLDPW W RWVRWRB VGHUWLQFWS 0K D Q J H L  
SRROV LQ 9HUPRQW V PDQDJHG IRUHUVK V6\ P:BRVGLX% LIRP  
WKH 1RUWKH%KQJQRQHWW/Q 97 \$SULO

5RVV ' 6 7KH FDUERQ EHQH D V Q G \ R R Z V R V D E S U H L Q W W K I H  
9HUPRQW V IRUH V W H Z R I Q Q O D D Q G Y 6 R V D I C H Y R U H V V P H U W H U  
0HHWLQJ )DLUOH 97 0DUFK

5RVV ' 6 6 : %DLOHQFH% %DZKDNQVHQ \$ ()UHDPUVRQ DQG  
%URXVVHDX 1HDU VXUIDFH VSHOLFDVUEIRQ W&LJKM  
DFURVV QR 6 W Z I D W H W U V K G C B X D S 8 0 \$ H W Q I Q J V F 6 D Q & \$ U D  
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%XOOHQ 7 ' %DLOH\ 6 : 0F\*XLUH6 . %R%WURDXOWH D& 3-LP  
0 \$ 8QGHUVWD 6 B V Q D Q G H W D D Q W F S R L D W B U R K H G V H V  
K\GURSHGRORJLFGDSS\$\*BDSFKQLDQY LOMHFWLVGR 6DSQ )UD  
'HFHPEHU

5RVV ' 6 5 \*UONHVUDQG\*R &ROEGLVK HQKIDQFH RHQW RI VR  
LQFUHDV LQJ FDUERQ Q H U P T R Q H W V S U D V W U R Q W D Q G H J D F U N P O D Q  
&HQWHU 5XSHUW 97 2FWREHU

5RVV ' 6 - , -XLOOHU DW DQG 6RQLD VRRWQJ SORWR LQQ F9DHL  
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5RVV ' 6 DQG \$ /DQJLURWWL LQ 2[RGDW DRQREMBG YHHG  
2[LGDWLRQ 7HV;W 1 D Q G S H Q F W U R V F R S \ \* R O G V F K P L G W  
-XQH

-XOLHWWH , -X5QOMUDW DQGHUFXUKURKSRVQLWWLW QUIDOO DQ  
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.QR[YLOOH 71 -XQH

<RXQJ ( 2 ' 6 5RHW DQ\$ 7 9LODDUYDULDELOGLSD\WRI ULSDU  
SKRVSKRUXV DW BFWL 5MLY HDORQDNWK & R Q B O B Q G H  
%XUOLQJWRQ 97 -XQH

5RVV ' 6 )R U H W R L Q H I D P U S H Q H G H J F K V X Q M V X S G R X U H W K : R U  
WKH 1RUWKH D V W I H Q J 1 6 R V L Z R O R I Q L W R \ 1 < 0DUFK

5RVV ' 6 - ,DQXGL 6 OHLDPW W D J 8 G U C E R I Q W I K H P Q Q R U H V W V  
:RUNVKRS RI WKH LIR 0 W Q H V R W H Q J 1 6 R V Z R F K N 7 U R \ 1 <

-XLOOHUDW - , DQG ' 6 5RVV XJK OLOWMFMUD OCH SRGLWXR  
DFFXPXODWLRQ LQ VRLOV LQIOXHXDFH PHHWUOLV RIFWRP  
\$PHULFDQ \*HRSK\VLFDQ 8QLRQ 6DQ )UDQFLVFR 'HFHPI  
5RVV ' 6 6 : %DL-CHUFDQBYLF QHUBDQBLXP RBUHVW VRI  
IURP WKUHH QRUYLQHDVZHGG VDWXHV KQQRVDDOPHBEQ  
6RLO 6FLHQFH GRFDHVLWV\$EXUJK 1RYHPEHU  
<RXQJ ( 2 ' 6 DGRVHGXQ DQG & : RUXDQFH R,IPBUJDQLF

5RVV ' 6 & DV E B Q E Q VRU L D V W I W K H K Q R O W Q N D J H V W R  
D Q G W U H H V S H F L Q H V R I \$ Q Q X 9 8 U P H R Q S H U P D Q L L Y R I U L Q X U Q R L R  
2 F W R E H U

5RVV ' 6 6 : L - Q P R V H U D W T & D O E R V Q I D Q G L R D W K R U V L Q  
Q R U W K H U Q I R U H V W W K \$ H Q S H K D P R Q M H Q S R L O D W R U Y H Q J % & R R L Q  
2 F W R E H U

5RVV ' 6 D Q G 6 : % D L L W H H Q F H R I V J R L O W F R I D W K L Q & R Q H 3 R Q G  
+ D P S V K L U H Z D W H H V K I H G F D W G R S R V R I Q X O F Q H P L H W L Q J \$ I W  
6 F L H Q F H 6 R F L H W \ R I \$ P H U L F D + R X V W R Q 2 F W R E H U

5RVV ' 6 \$ FSURULW R QWRH FRPW R B V OL Q ILOXUHQ EED WLR Q  
LQ QR UWK HDVWHUHQ 8 6 \$ GRU HV DVUHG Q DMDQWX 0%HL R6R JL'H'VH S  
890 1RYHPEHU

5RVV ' 6 & DUER Q D Q G H & PD UNDDVLRU VIKQNDVGVHUQ 86\$ I  
UHVHDFK VLWHV \$ R Q R D O B F I H W L F H U B F F W H 1 W H Z R 2 U \$ P H D Q V  
1RYHPEHU

\$OYHV & ( 2 <RXQJ DQG ' 6 5RVVXV DYD LYDDEXLDWWQJL S K9  
IORRG SODLQ VRLOVKH\$ Q R L X D G F L H H Q W P I Q R L F I D W W H R 2 U O H D  
1RYHPEHU

5RVV ' 6 % & : H R S O H H \* % 6 X Z U H Q F H - & D P \$ B H O O \$ - D P I  
\* ) U H G U L N V H Q Q 8 6 Q Q R V W M K U H F K V Z D M M W W R H L G V V X U I D  
K R U L J R Q & 1 L V D R D J H Q D M H Z H V Q F B W E R Q F H \* R Q G R Q & R Q  
% L R J H R F K H P L V W U \ R I & D W F K

5RVV ' %DLOH\ 6 -HUFLQRYLF 01H\*XIPVWVK&GVOR(30\$QDQ8  
V\QFKURWURQ [QG DIRG] LGDQWLI\LLQJHVPLQV FDIHXLQJPR  
1RUWKHDVW (FRV\VVWHDVWHVHD'XFK&RRS+ 2FWREHU  
\$XFK : DQG ' 5RVVMDVWHUQRIBWKKQWDCRS+JQLWHURRJJHQL  
GD\PLFURFRVP OHDFKDWV VWXG\ HPHSHWHQJURKWKH 1R  
&RRSHUDWLYH 'XUKDP 1+ 2FWREHU  
5RVV ' 6 & 1HJUSD /&Q]\*LXHWLDDVVRFLDDWLRIQDRI KHDY\ PH  
PDQJDQHVH R[LGHV RQWRRIH9KILWKRQQQV8D\$QV&6DFLOLW\  
G↑2OHURQ )UDQFH -XQH  
6KDQOH\ - % 6HEHVW\HQ 6 ' %RRQWU(D:VVDQGC5ROXVKLQJ  
DPRQJ VROXWHV \$EVOQXDOWP+HHLQJ\*HRSVKKML\$PIOU&EDR  
6DQ )UDQFLVFR 'HFHPEHU  
5RVV ' 6 + & +DOHCUDQGHQ U WKKH KDDSLVGLQFUHDVH  
QLWULILFDWLRQ/VWVHEDQVPS\$QCK6RLOPHGFWLHQFR16WKLH  
\$PHULFD 6DOW /DNH &LW\ 8WDK 1RYHPEHU  
9LOODUV 7 5 6 :5RVDLCHQG'-6% 6KDKOHUVW VWHSV LQ D  
PRQLWRULQJ VWXG\DOQP9HHUPLQWRH\$QCK6RWO &F\$PHULF  
6DOW /DNH &LW\ 8WDK 1RYHPEHU  
-RNHOD : ( ' 6 5RVV DQG - 3 RIQGDHLU\ PDQXZHQXWUHLBI  
LQ 9HUPRQW DJURQHROVDDQESQYFIDWRLOQW R\$QCKD6RL  
6FLHQFH 6RFLHWWR/ID\$PHULFD \$WDK 1RYHPEHU  
5RVV ' 6 DQG ( 2 <RXQJ 3KROV\$OUXORRIGCHGDVRLIQR  
6RLO (URVLRQ 5HVHDMWFKD'DERWDDWHRHJQGLDQD 2FWR  
:HPSOH % & ' 6 5RVP Åð0€P @DLOH\ ' 6

5RVV ' 6 + & +D O H G U D Q V G H Q D V W 5 L F S E G D D Q G M G Q D W X U H H  
R I I R U H V W V R L O Q Q L W R S K W H L F \$ @ H B Q L F R Q V S U L Q J P H H W



5RVV ' 6 \* % /DZUH QKFHQ D G - Q J& KRUHDFVWHGJ IZJLWHUVKH  
QLWULILFDWLRQKRW HJQMLH HZLVXUHPMIQVW R\$ QVXDOR  
6FLHQFH 6RFLHW\ RI \$PHULFD ,QGLDQDSROLV ,1

1HJUD & ' 6 5RMLV D W L S /DQ 6RLGHVD \$JDIHNFWR RQ ;\$1(  
UHDFWLYLW\ & VD\ \$QLQXDUO HGRVFLQJV %RXOGHU & 2

5RVV ' 6 6VDI S O H L M O R L M L F E D W K K % L Q X V K % U R R N Z D W H U  
1RUWKHDVW (FRV\ VWHP 5HVH D U F K & R R S H O W W H L Y H V Z R I U N  
HFRV\ VWHP UHVS R Q V H W R H O H Y D W H B O H W P S V S K H U L F 1

5RVV ' 6 D Q G + & + D I Q F D W L R Q W I L D W H I R P H D W U R Q H Q W V D Q  
\$ Q Q X D O 0 H H W L Q J Q F H G R K F L B W L O R 6 S P H U L E D & K D U O R W

1HJUD & D Q G ' 6 5 R L V O F R U U H S D W D R Q D Q G H V R L O P 0 Q R [ L G  
0 H H W L Q J V R I W K H L G R W O R F I \$ P I Q U H F O R & K D U O R W W H 1 &

/DZUH QFH \* % D Q G ' \$ F 5 R P X O D W L R Q R B H Q W W U R R O H Q F I R Q W L Q  
H S L V R G L F D F L G L I L Q D F W L R F Q X P G W S G I P K W H G 6 Z B R Q G V K H G  
, Q W H U Q D W L R Q D O V & R R Q J H Q H Q F W R P C F 0 D U \ O D Q G

5RVV ' 6 D Q G & 1 H J U D \$ V P D R C J L D Q W L V R Q R L G H H V G 6 Z [ W W K  
, Q W H U Q D W L R Q D O & R Q H R B K I Q F I H V R O \ W R V H 7 W D F O S ( K O H 2 P H O D U

5RVV ' 6 \* % Q D Z U H Q F H U D N V H 1 I L W Q L O H D D W U H P H Q W V D W 7  
L Q W K H & D W V N L O O V ( O Q L G \$ G P H R Q G I O F R I V L W Q U D Q G S I V R  
L Q 1 H Z < R U N / L O Q L Q \$ R O F I L H Q F \$ O E D Q \ 1 H Z < R U N

5RVV ' 6 ' R R I Q R E M U L I L Q D R U Q R V R G R I L O V W Z K H U H W R R E  
\* R U G R Q & R Q I H U H Q F H P L Q W L G U R I E J R U H I V W K I G Z : D D P H S W K L H G

5RVV ' 6 6 R Q Q I R U W D W L R Q W O W V O W H Q D Q R N L H H O D W L Y I  
Q R U W K H D V W L H W Q V U H V H I D P R E Q V & R Q S W K D V O L & R R \$ Q U D W R U V  
0 H H W L Q J 8 Q L Y 9 H U P R Q W

5RVV ' 6 + & + D Q H L V D Q G \$ V R W R Q L F I F O R P S U R D W W L L Q W Z R F  
Z D W H U V K H G V \* H R O \$ P H F L O D S R I L W K % D U O H Q J Q V R I Q V Z R C

0LQRFKD 5 \* % /DZUH QFH ' 6 5RVV @pRG\ PV



5RVV ' 6 5 - %DUWOHWW DQG =WKRIQVRLO FKH6RIPVHWDV SRH F  
WULGHFDPHULF DQXP LTKLXPGS, QOVH KVDWQL BQDQV \PSROVL  
, QWHUDEFWLRQ & RRV XRXZ \$XVWUDOLD

5RVV ' 6 DQG 5 - %D&JWDLR/VQWH [RKDIQ WHH VWSDFLQV RUJDQLF  
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5RVV ' 6 5 - 5%DDWGRMWDQG \* - 7.DDVLQIOXHQFH VRLOV E  
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5RVV ' 6 5 - %BUWQDGRM DQG ) 6RLO FKHPL

DPSOLQJ \$QGSDDO0H&MLDQFWLRIQWKDW%(RDA`pA \*DLQA JD RQIH \$Q  
AWLRAP&P&H°%P SPÆ) 5\$.00IRII 1LWULILFDWLRQLQ PHVWHG  
LIIHXUQDWLRQ0 `À€ RQ 3

*Soil Organic Matter* 366 FUHGLWV IDOO  
*Fundamentals of Soil Science* 366 FUHGLWV VXPPHU  
*Plant & Soil Science Seminar Series* 366 FUHGLW VISULQJ  
*Soil Classification Practicum* 366 FUHGLWV IDOO  
*Soil Science Colloquium* 366 FUHGLW VSULQJ  
*Soil Morphology, Classification and Land Use* 366 FUHGLWV IDOO  
*Advanced Independent Study* 366 FUHGLWV VXPPHU  
*Readings in Forest Biogeochemistry* 366 \*UDGXDRSL5SHFLDUHGLW VSUL  
*Soil Water Movement* 366 FUHGLWV VSULQJ  
*Advanced Soil Chemistry* 366 FUHGLWV VSULQJ

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 & \$/6 (QYLURQPHQW DO 6\$6 DQGHV 6FWHHQFDMRXU GHSSJULGGXKHDG  
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\*UDGXDWH 6WXGHQW & RPPLWWHHV FXUUHQW

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 9DQHVD 3HULOR 3K' 366  
 -HVVH \$UPIHOG 06 \*HRORJ\  
 0HJKDQ /HGXF 06 \*HRORJ\  
 .DWKU\Q :ULJOH\ 3K' 56(15  
 \*UDQW 5HHGHU 06 \*HRORJ\  
 1LFROH 5RJHUV 3K' 56(15  
 5HEHFFD 7KDUS 3K' 366

, QGSHQGHQW 6WXGHQW 6RLODWHFLMWHKJQW DGYLVVHHV \$GYLVVLQJ

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%XGG %DWFKHOGHU  
-HQQLIHU 'Z\HU

(36&R5 VWXGHQW LQWHUQV  
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%LRORJ\ DQG %LRFKHPILVVRUO 6RLIQDQFHUHRDL-RXURIDO :DWH  
6RLO 3ROOXWLRQ

3URSRVDO UHYLHZHU

3URSRVDO 5HYLHZ 3DQ5HQHYZD BQ'S \$QHUVRXUIDHWX DDC 5VKH  
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3URSRVDO 5HYLHZ (3DQ%HQURRURFKHFLF\$IOH,QWLFQWD%WRBQVLOD  
IRU LQ VLWX 5HPHGLQVLRQDQFHVDJDXURQDPR 1& \$\$  
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(QYLURQPHQW -XQH :DVKLQJWRQ' &  
3URSRVDO 5HYLHZ 3DQHO IRU ,PDJLQJ DDCG \*HLFVRLSHURFHVHV D  
1DWLRQDO 6\QFKURHW %RQRINJKQVY HQRXUWLRQSDUHQVDEQRW D  
16) (FRV\VWHPV SUHVHQW QRW DOO \HDUV  
16) (DUWK 6FLHQFHV SUHVHQW  
/DNH &KDPSODLQ %DVLQXSDURJUD,PSDQVYHPHQW \*UDQWV  
-HIIULHV 0HPRULDO 7UXVW  
16) +\GURORJLFDQ 6FLHQFHV  
6RXWK \$IULFDQ 15)  
86'\$ 6PDOO %QVRQDQWVLRQ 5HVHDUFK  
890 +DWFK SDQHO  
86'\$ 1DWLRQDQK5HQVHWLDWLYH

16) (DUWK @F BUSP pPÀDQJ•PHQW D À0P 0 ` @ð0P€T-RX\$VQP0H@ <C

1RUWKHDVW 6RLO 0RQLWRULQJ :RSNHVRISV VWHHULQJ F

Former:

1RUWKHDVWHUPH 9% UDRFF KR R \$ WJKEHIS WRS \$6\$ HQW DW

1RUWK & HQWUD Q V&RPO ; RUD 6 6RFXWQ FV L5Q 6RDO F6F 1 & 5

1RUWK & HQWRD Q R&RFPWL 6 R/HOV 1 & 5

&RPPLWWHH 6HUYLEFH 890

Current:

)DFXOW\ 6HQDWH )LQDQFLDO DQG \$KUVLFHQ 3SDQW LFQJ&B

6WHHULQJ &RPPLWWHH RQ ,QFHQWLYH %DVHG %XGJHWLQ.

366 \*UDGXDWH &RPPLWWHH SUHVHQW

