

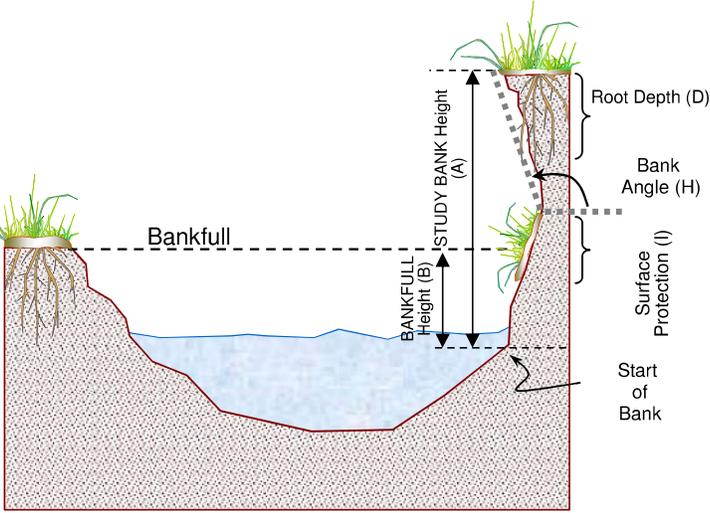
Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

| | | | |
|---------------------------|------------------------|------------------------------|--|
| Stream: Taylor Run | | Location: BEHI #2 | |
| Station: 65 ft | | Observers: Biggs/Hepp | |
| Date: 3/29/18 | Stream Type: F4 | Valley Type: VI | |

| | | | | | |
|--|-----------------|--------------------------|-----------------|-----------------|------------------------------|
| Study Bank Height / Bankfull Height (C) | | | | | BEHI Score (Fig. 3-7) |
| Study Bank Height (ft) = | 6.50 (A) | Bankfull Height (ft) = | 0.90 (B) | (A) / (B) = | 7.22 (C) |
| | | | | | 10.0 |
| Root Depth / Study Bank Height (E) | | | | | |
| Root Depth (ft) = | 3.00 (D) | Study Bank Height (ft) = | 6.50 (A) | (D) / (A) = | 0.46 (E) |
| | | | | | 4.1 |
| Weighted Root Density (G) | | | | | |
| Root Density as % = | 5.00 (F) | (F) × (E) = | | | 2.31 (G) |
| | | | | | 9.5 |
| Bank Angle (H) | | | | | |
| Bank Angle as Degrees = | 85 (H) | | | | 6.5 |
| Surface Protection (I) | | | | | |
| Surface Protection as % = | 5% (I) | | | | 10.0 |

| | |
|--|---|
| Bank Material Adjustment: | |
| Bedrock (Overall Very Low BEHI) |  |
| Boulders (Overall Low BEHI) | |
| Cobble (Subtract 10 points if uniform medium to large cobble) | |
| Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand) | |
| Sand (Add 10 points) | |
| Silt/Clay (no adjustment) | |
| | Bank Material Adjustment |
| | Stratification Adjustment |
| | Add 5–10 points, depending on position of unstable layers in relation to bankfull stage |
| | 5 |
| | 5 |

| | | | | | | | |
|-----------------|------------|-----------------|-------------|------------------|----------------|---|----------------|
| Very Low | Low | Moderate | High | Very High | Extreme | Adjective Rating and Total Score | Extreme |
| 5 – 9.5 | 10 – 19.5 | 20 – 29.5 | 30 – 39.5 | 40 – 45 | 46 – 50 | | |

Worksheet 3-12. Various field methods of estimating Near-Bank Stress (NBS) risk ratings to calculate erosion rate.

| Estimating Near-Bank Stress (NBS) | | | | | | | | | |
|---|------------------|--|-------------------------------|---|---------------------------|------------------------|---|--------------------------------|------------------------|
| Stream: Taylor Run | | | | | Location: BEHI #2 | | | | |
| Station: 65 ft | | | Stream Type: F4 | | | Valley Type: VI | | | |
| Observers: Biggs/Hepp | | | | | Date: 3/29/18 | | | | |
| Methods for Estimating Near-Bank Stress (NBS) | | | | | | | | | |
| (1) Channel pattern, transverse bar or split channel/central bar creating NBS | | | | | Level I | | Reconnaissance | | |
| (2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf}) | | | | | Level II | | General prediction | | |
| (3) Ratio of pool slope to average water surface slope (S_p / S) | | | | | Level II | | General prediction | | |
| (4) Ratio of pool slope to riffle slope (S_p / S_{rif}) | | | | | Level II | | General prediction | | |
| (5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf}) | | | | | Level III | | Detailed prediction | | |
| (6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf}) | | | | | Level III | | Detailed prediction | | |
| (7) Velocity profiles / Isovels / Velocity gradient | | | | | Level IV | | Validation | | |
| Level I | (1) | Transverse and/or central bars-short and/or discontinuous.....NBS = High / Very High | | | | | | | |
| | | Extensive deposition (continuous, cross-channel).....NBS = Extreme | | | | | | | |
| | | Chute cutoffs, down-valley meander migration, converging flow.....NBS = Extreme | | | | | | | |
| Level II | (2) | Radius of Curvature R_c (ft) | Bankfull Width W_{bkf} (ft) | Ratio R_c / W_{bkf} | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| | (3) | Pool Slope S_p | Average Slope S | Ratio S_p / S | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| (4) | Pool Slope S_p | Riffle Slope S_{rif} | Ratio S_p / S_{rif} | Near-Bank Stress (NBS) | | | | | |
| | | | | | | | | | |
| Level III | (5) | Near-Bank Max Depth d_{nb} (ft) | Mean Depth d_{bkf} (ft) | Ratio d_{nb} / d_{bkf} | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| | (6) | Near-Bank Max Depth d_{nb} (ft) | Near-Bank Slope S_{nb} | Near-Bank Shear Stress τ_{nb} (lb/ft ²) | Mean Depth d_{bkf} (ft) | Average Slope S | Bankfull Shear Stress τ_{bkf} (lb/ft ²) | Ratio τ_{nb} / τ_{bkf} | Near-Bank Stress (NBS) |
| | | | | | | | | | |
| Level IV | (7) | Velocity Gradient (ft / sec / ft) | | Near-Bank Stress (NBS) | | | | | |
| | | | | | | | | | |
| Converting Values to a Near-Bank Stress (NBS) Rating | | | | | | | | | |
| Near-Bank Stress (NBS) ratings | Method number | | | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | | |
| Very Low | N / A | > 3.00 | < 0.20 | < 0.40 | < 1.00 | < 0.80 | < 0.50 | | |
| Low | N / A | 2.21 – 3.00 | 0.20 – 0.40 | 0.41 – 0.60 | 1.00 – 1.50 | 0.80 – 1.05 | 0.50 – 1.00 | | |
| Moderate | N / A | 2.01 – 2.20 | 0.41 – 0.60 | 0.61 – 0.80 | 1.51 – 1.80 | 1.06 – 1.14 | 1.01 – 1.60 | | |
| High | See | 1.81 – 2.00 | 0.61 – 0.80 | 0.81 – 1.00 | 1.81 – 2.50 | 1.15 – 1.19 | 1.61 – 2.00 | | |
| Very High | (1) | 1.50 – 1.80 | 0.81 – 1.00 | 1.01 – 1.20 | 2.51 – 3.00 | 1.20 – 1.60 | 2.01 – 2.40 | | |
| Extreme | Above | < 1.50 | > 1.00 | > 1.20 | > 3.00 | > 1.60 | > 2.40 | | |
| Overall Near-Bank Stress (NBS) rating | | | | | | High | | | |

**Dominant
Near-Bank Stress
High**

Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

| | | | |
|---------------------------|------------------------|------------------------------|--|
| Stream: Taylor Run | | Location: BEHI #4 | |
| Station: 70 ft | | Observers: Biggs/Hepp | |
| Date: 3/29/18 | Stream Type: F4 | Valley Type: VI | |

| | | | | | |
|--|-----------------|------------------------|-----------------|------------------------------|-----------------|
| Study Bank Height / Bankfull Height (C) | | | | BEHI Score (Fig. 3-7) | |
| Study Bank Height (ft) = | 8.00 (A) | Bankfull Height (ft) = | 0.90 (B) | (A) / (B) = | 8.89 (C) |
| | | | | | 10.0 |

| | | | | | |
|---|-----------------|--------------------------|-----------------|-----------------|-----------------|
| Root Depth / Study Bank Height (E) | | | | | |
| Root Depth (ft) = | 4.00 (D) | Study Bank Height (ft) = | 8.00 (A) | (D) / (A) = | 0.50 (E) |
| | | | | | 3.8 |

| | | | | | |
|------------------------------------|------------------|-----------------|---------------|--|------------|
| Weighted Root Density (G) | | | | | |
| Root Density as % = | 35.00 (F) | (F) × (E) = | 18 (G) | | |
| | | | | | 7.5 |

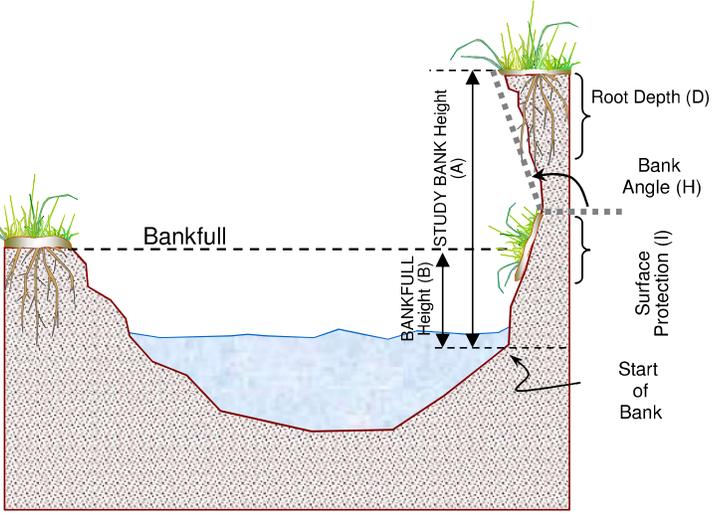
| | | | | | |
|-------------------------|---------------|--|--|--|------------|
| Bank Angle (H) | | | | | |
| Bank Angle as Degrees = | 65 (H) | | | | |
| | | | | | 4.2 |

| | | | | | |
|---------------------------------|---------------|--|--|--|-------------|
| Surface Protection (I) | | | | | |
| Surface Protection as % = | 0% (I) | | | | |
| | | | | | 10.0 |

| | | | | | | | |
|--|----------|--|---|---------------------------------|----------|---|----------|
| Bank Material Adjustment: | | | | | | | |
| <ul style="list-style-type: none"> Bedrock (Overall Very Low BEHI) Boulders (Overall Low BEHI) Cobble (Subtract 10 points if uniform medium to large cobble) <li style="background-color: yellow;">Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand) Sand (Add 10 points) Silt/Clay (no adjustment) | ➔ | | <table border="1" style="width:100%; border-collapse: collapse; text-align: center;"> <tr> <td>Bank Material Adjustment</td> <td>5</td> </tr> <tr> <td>Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage</td> <td>5</td> </tr> </table> | Bank Material Adjustment | 5 | Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage | 5 |
| Bank Material Adjustment | 5 | | | | | | |
| Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage | 5 | | | | | | |

| | | | | | | | |
|-----------------|------------|-----------------|-------------|------------------|----------------|---|---------------------------------|
| Very Low | Low | Moderate | High | Very High | Extreme | Adjective Rating and Total Score | Very High 45.5 |
| 5 – 9.5 | 10 – 19.5 | 20 – 29.5 | 30 – 39.5 | 40 – 45 | 46 – 50 | | |





Worksheet 3-12. Various field methods of estimating Near-Bank Stress (NBS) risk ratings to calculate erosion rate.

| Estimating Near-Bank Stress (NBS) | | | | | | | | | |
|---|------------------|--|-------------------------------|---|---------------------------|------------------------|---|--------------------------------|------------------------|
| Stream: Taylor Run | | | | | Location: BEHI #4 | | | | |
| Station: 70 ft | | | Stream Type: F4 | | | Valley Type: VI | | | |
| Observers: Biggs/Hepp | | | | | Date: 3/29/18 | | | | |
| Methods for Estimating Near-Bank Stress (NBS) | | | | | | | | | |
| (1) Channel pattern, transverse bar or split channel/central bar creating NBS | | | | | Level I | | Reconnaissance | | |
| (2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf}) | | | | | Level II | | General prediction | | |
| (3) Ratio of pool slope to average water surface slope (S_p / S) | | | | | Level II | | General prediction | | |
| (4) Ratio of pool slope to riffle slope (S_p / S_{rif}) | | | | | Level II | | General prediction | | |
| (5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf}) | | | | | Level III | | Detailed prediction | | |
| (6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf}) | | | | | Level III | | Detailed prediction | | |
| (7) Velocity profiles / Isovels / Velocity gradient | | | | | Level IV | | Validation | | |
| Level I | (1) | Transverse and/or central bars-short and/or discontinuous.....NBS = High / Very High | | | | | | | |
| | | Extensive deposition (continuous, cross-channel).....NBS = Extreme | | | | | | | |
| | | Chute cutoffs, down-valley meander migration, converging flow.....NBS = Extreme | | | | | | | |
| Level II | (2) | Radius of Curvature R_c (ft) | Bankfull Width W_{bkf} (ft) | Ratio R_c / W_{bkf} | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| | (3) | Pool Slope S_p | Average Slope S | Ratio S_p / S | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| (4) | Pool Slope S_p | Riffle Slope S_{rif} | Ratio S_p / S_{rif} | Near-Bank Stress (NBS) | | | | | |
| | | | | | | | | | |
| Level III | (5) | Near-Bank Max Depth d_{nb} (ft) | Mean Depth d_{bkf} (ft) | Ratio d_{nb} / d_{bkf} | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| | (6) | Near-Bank Max Depth d_{nb} (ft) | Near-Bank Slope S_{nb} | Near-Bank Shear Stress τ_{nb} (lb/ft ²) | Mean Depth d_{bkf} (ft) | Average Slope S | Bankfull Shear Stress τ_{bkf} (lb/ft ²) | Ratio τ_{nb} / τ_{bkf} | Near-Bank Stress (NBS) |
| | | | | | | | | | |
| Level IV | (7) | Velocity Gradient (ft / sec / ft) | | Near-Bank Stress (NBS) | | | | | |
| | | | | | | | | | |
| Converting Values to a Near-Bank Stress (NBS) Rating | | | | | | | | | |
| Near-Bank Stress (NBS) ratings | Method number | | | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | | |
| Very Low | N / A | > 3.00 | < 0.20 | < 0.40 | < 1.00 | < 0.80 | < 0.50 | | |
| Low | N / A | 2.21 – 3.00 | 0.20 – 0.40 | 0.41 – 0.60 | 1.00 – 1.50 | 0.80 – 1.05 | 0.50 – 1.00 | | |
| Moderate | N / A | 2.01 – 2.20 | 0.41 – 0.60 | 0.61 – 0.80 | 1.51 – 1.80 | 1.06 – 1.14 | 1.01 – 1.60 | | |
| High | See | 1.81 – 2.00 | 0.61 – 0.80 | 0.81 – 1.00 | 1.81 – 2.50 | 1.15 – 1.19 | 1.61 – 2.00 | | |
| Very High | (1) | 1.50 – 1.80 | 0.81 – 1.00 | 1.01 – 1.20 | 2.51 – 3.00 | 1.20 – 1.60 | 2.01 – 2.40 | | |
| Extreme | Above | < 1.50 | > 1.00 | > 1.20 | > 3.00 | > 1.60 | > 2.40 | | |
| Overall Near-Bank Stress (NBS) rating | | | | | | High | | | |

**Dominant
Near-Bank Stress
High**

Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

| | | | |
|---------------------------|------------------------|------------------------------|--|
| Stream: Taylor Run | | Location: BEHI #6 | |
| Station: 73 ft | | Observers: Biggs/Hepp | |
| Date: 3/29/18 | Stream Type: F4 | Valley Type: V1 | |

| | | | | | |
|--|------------------|--------------------------|-----------------|------------------------------|-----------------|
| Study Bank Height / Bankfull Height (C) | | | | BEHI Score (Fig. 3-7) | |
| Study Bank Height (ft) = | 4.50 (A) | Bankfull Height (ft) = | 0.90 (B) | (A) / (B) = | 5.00 (C) |
| | | | | | 10.0 |
| Root Depth / Study Bank Height (E) | | | | | |
| Root Depth (ft) = | 2.00 (D) | Study Bank Height (ft) = | 4.50 (A) | (D) / (A) = | 0.44 (E) |
| | | | | | 4.3 |
| Weighted Root Density (G) | | | | | |
| Root Density as % = | 10.00 (F) | (F) × (E) = | | | 4.44 (G) |
| | | | | | 9.5 |
| Bank Angle (H) | | | | | |
| Bank Angle as Degrees = | | | | | 75 (H) |
| | | | | | 5.3 |
| Surface Protection (I) | | | | | |
| Surface Protection as % = | | | | | 30% (I) |
| | | | | | 6.0 |

| | | | | | |
|--|---|---------------------------------|----------|---|----------|
| Bank Material Adjustment: | | | | | |
| <ul style="list-style-type: none"> Bedrock (Overall Very Low BEHI) Boulders (Overall Low BEHI) Cobble (Subtract 10 points if uniform medium to large cobble) Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand) Sand (Add 10 points) Silt/Clay (no adjustment) | <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>Bank Material Adjustment</td> <td>5</td> </tr> <tr> <td>Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage</td> <td>5</td> </tr> </table> | Bank Material Adjustment | 5 | Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage | 5 |
| Bank Material Adjustment | 5 | | | | |
| Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage | 5 | | | | |

| | | | | | | | |
|-----------------|------------|-----------------|-------------|------------------|----------------|---|------------------|
| Very Low | Low | Moderate | High | Very High | Extreme | Adjective Rating and Total Score | Very High |
| 5 – 9.5 | 10 – 19.5 | 20 – 29.5 | 30 – 39.5 | 40 – 45 | 46 – 50 | | 45.1 |

Worksheet 3-12. Various field methods of estimating Near-Bank Stress (NBS) risk ratings to calculate erosion rate.

| Estimating Near-Bank Stress (NBS) | | | | | | | | | |
|---|------------------|--|-------------------------------|---|---------------------------|------------------------|---|--------------------------------|------------------------|
| Stream: Taylor Run | | | | | Location: BEHI #6 | | | | |
| Station: 73 ft | | | Stream Type: F4 | | | Valley Type: V1 | | | |
| Observers: Biggs/Hepp | | | | | Date: 3/29/18 | | | | |
| Methods for Estimating Near-Bank Stress (NBS) | | | | | | | | | |
| (1) Channel pattern, transverse bar or split channel/central bar creating NBS | | | | | Level I | | Reconnaissance | | |
| (2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf}) | | | | | Level II | | General prediction | | |
| (3) Ratio of pool slope to average water surface slope (S_p / S) | | | | | Level II | | General prediction | | |
| (4) Ratio of pool slope to riffle slope (S_p / S_{rif}) | | | | | Level II | | General prediction | | |
| (5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf}) | | | | | Level III | | Detailed prediction | | |
| (6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf}) | | | | | Level III | | Detailed prediction | | |
| (7) Velocity profiles / Isovels / Velocity gradient | | | | | Level IV | | Validation | | |
| Level I | (1) | Transverse and/or central bars-short and/or discontinuous.....NBS = High / Very High | | | | | | | |
| | | Extensive deposition (continuous, cross-channel).....NBS = Extreme | | | | | | | |
| | | Chute cutoffs, down-valley meander migration, converging flow.....NBS = Extreme | | | | | | | |
| Level II | (2) | Radius of Curvature R_c (ft) | Bankfull Width W_{bkf} (ft) | Ratio R_c / W_{bkf} | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| | (3) | Pool Slope S_p | Average Slope S | Ratio S_p / S | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| (4) | Pool Slope S_p | Riffle Slope S_{rif} | Ratio S_p / S_{rif} | Near-Bank Stress (NBS) | | | | | |
| | | | | | | | | | |
| Level III | (5) | Near-Bank Max Depth d_{nb} (ft) | Mean Depth d_{bkf} (ft) | Ratio d_{nb} / d_{bkf} | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| | (6) | Near-Bank Max Depth d_{nb} (ft) | Near-Bank Slope S_{nb} | Near-Bank Shear Stress τ_{nb} (lb/ft ²) | Mean Depth d_{bkf} (ft) | Average Slope S | Bankfull Shear Stress τ_{bkf} (lb/ft ²) | Ratio τ_{nb} / τ_{bkf} | Near-Bank Stress (NBS) |
| | | | | | | | | | |
| Level IV | (7) | Velocity Gradient (ft / sec / ft) | | Near-Bank Stress (NBS) | | | | | |
| | | | | | | | | | |
| Converting Values to a Near-Bank Stress (NBS) Rating | | | | | | | | | |
| Near-Bank Stress (NBS) ratings | Method number | | | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | | |
| Very Low | N / A | > 3.00 | < 0.20 | < 0.40 | < 1.00 | < 0.80 | < 0.50 | | |
| Low | N / A | 2.21 – 3.00 | 0.20 – 0.40 | 0.41 – 0.60 | 1.00 – 1.50 | 0.80 – 1.05 | 0.50 – 1.00 | | |
| Moderate | N / A | 2.01 – 2.20 | 0.41 – 0.60 | 0.61 – 0.80 | 1.51 – 1.80 | 1.06 – 1.14 | 1.01 – 1.60 | | |
| High | See | 1.81 – 2.00 | 0.61 – 0.80 | 0.81 – 1.00 | 1.81 – 2.50 | 1.15 – 1.19 | 1.61 – 2.00 | | |
| Very High | (1) | 1.50 – 1.80 | 0.81 – 1.00 | 1.01 – 1.20 | 2.51 – 3.00 | 1.20 – 1.60 | 2.01 – 2.40 | | |
| Extreme | Above | < 1.50 | > 1.00 | > 1.20 | > 3.00 | > 1.60 | > 2.40 | | |
| Overall Near-Bank Stress (NBS) rating | | | | | | Very High | | | |

**Dominant
Near-Bank Stress
Very High**

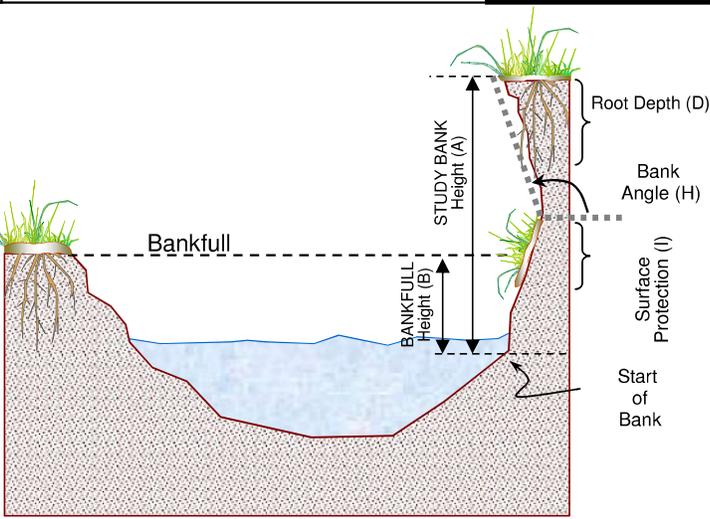
Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

| | | | |
|---------------------------|------------------------|------------------------------|--|
| Stream: Taylor Run | | Location: BEHI #7 | |
| Station: 110 ft | | Observers: Biggs/Hepp | |
| Date: 3/29/18 | Stream Type: F4 | Valley Type: VI | |

| | | | | | |
|--|------------------|--------------------------|------------------|-----------------|------------------------------|
| Study Bank Height / Bankfull Height (C) | | | | | BEHI Score (Fig. 3-7) |
| Study Bank Height (ft) = | 10.00 (A) | Bankfull Height (ft) = | 0.90 (B) | (A) / (B) = | 11.11 (C) |
| | | | | | 10.0 |
| Root Depth / Study Bank Height (E) | | | | | |
| Root Depth (ft) = | 5.00 (D) | Study Bank Height (ft) = | 10.00 (A) | (D) / (A) = | 0.50 (E) |
| | | | | | 3.8 |
| Weighted Root Density (G) | | | | | |
| Root Density as % = | 10.00 (F) | (F) × (E) = | | | 5.00 (G) |
| | | | | | 9.5 |
| Bank Angle (H) | | | | | |
| Bank Angle as Degrees = | 70 (H) | | | | |
| | | | | | 4.5 |
| Surface Protection (I) | | | | | |
| Surface Protection as % = | 5% (I) | | | | |
| | | | | | 10.0 |

| | |
|--|---|
| Bank Material Adjustment: | Bank Material Adjustment |
| <ul style="list-style-type: none"> Bedrock (Overall Very Low BEHI) Boulders (Overall Low BEHI) Cobble (Subtract 10 points if uniform medium to large cobble) Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand) Sand (Add 10 points) Silt/Clay (no adjustment) | 5 |
| | Stratification Adjustment |
| | Add 5–10 points, depending on position of unstable layers in relation to bankfull stage |
| | 5 |

| | | | | | | | |
|-----------------|------------|-----------------|-------------|------------------|----------------|---|----------------|
| Very Low | Low | Moderate | High | Very High | Extreme | Adjective Rating and Total Score | Extreme |
| 5 – 9.5 | 10 – 19.5 | 20 – 29.5 | 30 – 39.5 | 40 – 45 | 46 – 50 | | 47.8 |

Worksheet 3-12. Various field methods of estimating Near-Bank Stress (NBS) risk ratings to calculate erosion rate.

| Estimating Near-Bank Stress (NBS) | | | | | | | | | |
|---|------------------|--|-------------------------------|---|---------------------------|------------------------|---|--------------------------------|------------------------|
| Stream: Taylor Run | | | | | Location: BEHI #7 | | | | |
| Station: 110 ft | | | Stream Type: F4 | | | Valley Type: VI | | | |
| Observers: Biggs/Hepp | | | | | Date: 3/29/18 | | | | |
| Methods for Estimating Near-Bank Stress (NBS) | | | | | | | | | |
| (1) Channel pattern, transverse bar or split channel/central bar creating NBS | | | | | Level I | | Reconnaissance | | |
| (2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf}) | | | | | Level II | | General prediction | | |
| (3) Ratio of pool slope to average water surface slope (S_p / S) | | | | | Level II | | General prediction | | |
| (4) Ratio of pool slope to riffle slope (S_p / S_{rif}) | | | | | Level II | | General prediction | | |
| (5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf}) | | | | | Level III | | Detailed prediction | | |
| (6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf}) | | | | | Level III | | Detailed prediction | | |
| (7) Velocity profiles / Isovels / Velocity gradient | | | | | Level IV | | Validation | | |
| Level I | (1) | Transverse and/or central bars-short and/or discontinuous.....NBS = High / Very High | | | | | | | |
| | | Extensive deposition (continuous, cross-channel).....NBS = Extreme | | | | | | | |
| | | Chute cutoffs, down-valley meander migration, converging flow.....NBS = Extreme | | | | | | | |
| Level II | (2) | Radius of Curvature R_c (ft) | Bankfull Width W_{bkf} (ft) | Ratio R_c / W_{bkf} | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| | (3) | Pool Slope S_p | Average Slope S | Ratio S_p / S | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| (4) | Pool Slope S_p | Riffle Slope S_{rif} | Ratio S_p / S_{rif} | Near-Bank Stress (NBS) | | | | | |
| | | | | | | | | | |
| Level III | (5) | Near-Bank Max Depth d_{nb} (ft) | Mean Depth d_{bkf} (ft) | Ratio d_{nb} / d_{bkf} | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| | (6) | Near-Bank Max Depth d_{nb} (ft) | Near-Bank Slope S_{nb} | Near-Bank Shear Stress τ_{nb} (lb/ft ²) | Mean Depth d_{bkf} (ft) | Average Slope S | Bankfull Shear Stress τ_{bkf} (lb/ft ²) | Ratio τ_{nb} / τ_{bkf} | Near-Bank Stress (NBS) |
| | | | | | | | | | |
| Level IV | (7) | Velocity Gradient (ft / sec / ft) | | Near-Bank Stress (NBS) | | | | | |
| | | | | | | | | | |
| Converting Values to a Near-Bank Stress (NBS) Rating | | | | | | | | | |
| Near-Bank Stress (NBS) ratings | Method number | | | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | | |
| Very Low | N / A | > 3.00 | < 0.20 | < 0.40 | < 1.00 | < 0.80 | < 0.50 | | |
| Low | N / A | 2.21 – 3.00 | 0.20 – 0.40 | 0.41 – 0.60 | 1.00 – 1.50 | 0.80 – 1.05 | 0.50 – 1.00 | | |
| Moderate | N / A | 2.01 – 2.20 | 0.41 – 0.60 | 0.61 – 0.80 | 1.51 – 1.80 | 1.06 – 1.14 | 1.01 – 1.60 | | |
| High | See | 1.81 – 2.00 | 0.61 – 0.80 | 0.81 – 1.00 | 1.81 – 2.50 | 1.15 – 1.19 | 1.61 – 2.00 | | |
| Very High | (1) | 1.50 – 1.80 | 0.81 – 1.00 | 1.01 – 1.20 | 2.51 – 3.00 | 1.20 – 1.60 | 2.01 – 2.40 | | |
| Extreme | Above | < 1.50 | > 1.00 | > 1.20 | > 3.00 | > 1.60 | > 2.40 | | |
| Overall Near-Bank Stress (NBS) rating | | | | | | High | | | |

**Dominant
Near-Bank Stress
High**

Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

| | | | |
|---------------------------|------------------------|------------------------------|--|
| Stream: Taylor Run | | Location: BEHI #8 | |
| Station: 107 ft | | Observers: Biggs/Hepp | |
| Date: 3/29/18 | Stream Type: F4 | Valley Type: VI | |

| | | | | | |
|--|-----------------|------------------------|-----------------|-----------------|------------------------------|
| Study Bank Height / Bankfull Height (C) | | | | | BEHI Score (Fig. 3-7) |
| Study Bank Height (ft) = | 8.00 (A) | Bankfull Height (ft) = | 0.90 (B) | (A) / (B) = | 8.89 (C) |
| | | | | | 10.0 |

| | | | | | |
|---|-----------------|--------------------------|-----------------|-----------------|-----------------|
| Root Depth / Study Bank Height (E) | | | | | |
| Root Depth (ft) = | 4.00 (D) | Study Bank Height (ft) = | 8.00 (A) | (D) / (A) = | 0.50 (E) |
| | | | | | 3.8 |

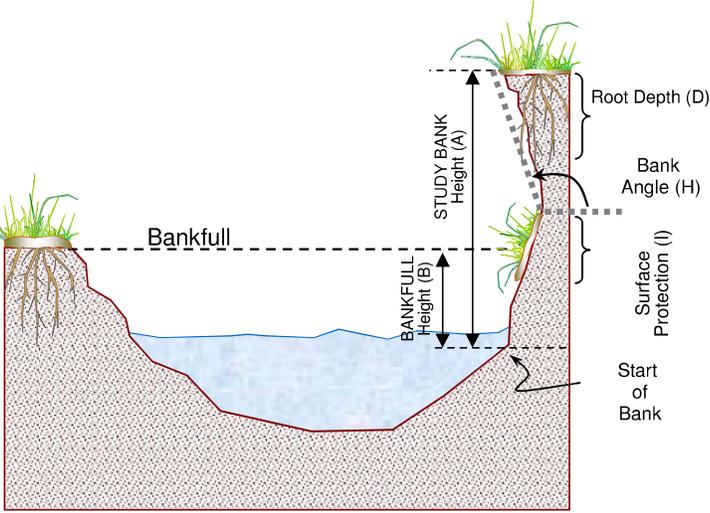
| | | | | | |
|------------------------------------|------------------|-----------------|-----------------|--|------------|
| Weighted Root Density (G) | | | | | |
| Root Density as % = | 10.00 (F) | (F) × (E) = | 5.00 (G) | | |
| | | | | | 9.5 |

| | | | |
|-------------------------|---------------|--|------------|
| Bank Angle (H) | | | |
| Bank Angle as Degrees = | 70 (H) | | |
| | | | 4.5 |

| | | | |
|---------------------------------|---------------|--|-------------|
| Surface Protection (I) | | | |
| Surface Protection as % = | 0% (I) | | |
| | | | 10.0 |

| | | | | | |
|---|---|---------------------------------|----------|---|----------|
| Bank Material Adjustment: | | | | | |
| <p>Bedrock (Overall Very Low BEHI)</p> <p>Boulders (Overall Low BEHI)</p> <p>Cobble (Subtract 10 points if uniform medium to large cobble)</p> <p>Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand)</p> <p>Sand (Add 10 points)</p> <p>Silt/Clay (no adjustment)</p> | <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>Bank Material Adjustment</td> <td>5</td> </tr> <tr> <td>Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage</td> <td>5</td> </tr> </table> | Bank Material Adjustment | 5 | Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage | 5 |
| Bank Material Adjustment | 5 | | | | |
| Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage | 5 | | | | |

| | | | | | | | |
|-----------------|------------|-----------------|-------------|------------------|----------------|---|----------------|
| Very Low | Low | Moderate | High | Very High | Extreme | Adjective Rating and Total Score | Extreme |
| 5 – 9.5 | 10 – 19.5 | 20 – 29.5 | 30 – 39.5 | 40 – 45 | 46 – 50 | | 47.8 |

Worksheet 3-12. Various field methods of estimating Near-Bank Stress (NBS) risk ratings to calculate erosion rate.

| Estimating Near-Bank Stress (NBS) | | | | | | | | | |
|---|-----------------------------------|--|---|---------------------------|--------------------------|---|--------------------------------|------------------------|--|
| Stream: Taylor Run | | | | | Location: BEHI #8 | | | | |
| Station: 107 ft | | | Stream Type: F4 | | | Valley Type: VI | | | |
| Observers: Biggs/Hepp | | | | | Date: 3/29/18 | | | | |
| Methods for Estimating Near-Bank Stress (NBS) | | | | | | | | | |
| (1) Channel pattern, transverse bar or split channel/central bar creating NBS | | | | | Level I | | Reconnaissance | | |
| (2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf}) | | | | | Level II | | General prediction | | |
| (3) Ratio of pool slope to average water surface slope (S_p / S) | | | | | Level II | | General prediction | | |
| (4) Ratio of pool slope to riffle slope (S_p / S_{rif}) | | | | | Level II | | General prediction | | |
| (5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf}) | | | | | Level III | | Detailed prediction | | |
| (6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf}) | | | | | Level III | | Detailed prediction | | |
| (7) Velocity profiles / Isovels / Velocity gradient | | | | | Level IV | | Validation | | |
| Level I | (1) | Transverse and/or central bars-short and/or discontinuous.....NBS = High / Very High | | | | | | | |
| | | Extensive deposition (continuous, cross-channel).....NBS = Extreme | | | | | | | |
| | | Chute cutoffs, down-valley meander migration, converging flow.....NBS = Extreme | | | | | | | |
| Level II | (2) | Radius of Curvature R_c (ft) | Bankfull Width W_{bkf} (ft) | Ratio R_c / W_{bkf} | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| | (3) | Pool Slope S_p | Average Slope S | Ratio S_p / S | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| (4) | Pool Slope S_p | Riffle Slope S_{rif} | Ratio S_p / S_{rif} | Near-Bank Stress (NBS) | | | | | |
| | | | | | | | | | |
| Level III | (5) | Near-Bank Max Depth d_{nb} (ft) | Mean Depth d_{bkf} (ft) | Ratio d_{nb} / d_{bkf} | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| (6) | Near-Bank Max Depth d_{nb} (ft) | Near-Bank Slope S_{nb} | Near-Bank Shear Stress τ_{nb} (lb/ft ²) | Mean Depth d_{bkf} (ft) | Average Slope S | Bankfull Shear Stress τ_{bkf} (lb/ft ²) | Ratio τ_{nb} / τ_{bkf} | Near-Bank Stress (NBS) | |
| | | | | | | | | | |
| Level IV | (7) | Velocity Gradient (ft / sec / ft) | | Near-Bank Stress (NBS) | | | | | |
| | | | | | | | | | |
| Converting Values to a Near-Bank Stress (NBS) Rating | | | | | | | | | |
| Near-Bank Stress (NBS) ratings | Method number | | | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | | |
| Very Low | N / A | > 3.00 | < 0.20 | < 0.40 | < 1.00 | < 0.80 | < 0.50 | | |
| Low | N / A | 2.21 – 3.00 | 0.20 – 0.40 | 0.41 – 0.60 | 1.00 – 1.50 | 0.80 – 1.05 | 0.50 – 1.00 | | |
| Moderate | N / A | 2.01 – 2.20 | 0.41 – 0.60 | 0.61 – 0.80 | 1.51 – 1.80 | 1.06 – 1.14 | 1.01 – 1.60 | | |
| High | See | 1.81 – 2.00 | 0.61 – 0.80 | 0.81 – 1.00 | 1.81 – 2.50 | 1.15 – 1.19 | 1.61 – 2.00 | | |
| Very High | (1) | 1.50 – 1.80 | 0.81 – 1.00 | 1.01 – 1.20 | 2.51 – 3.00 | 1.20 – 1.60 | 2.01 – 2.40 | | |
| Extreme | Above | < 1.50 | > 1.00 | > 1.20 | > 3.00 | > 1.60 | > 2.40 | | |
| Overall Near-Bank Stress (NBS) rating | | | | | | High | | | |

**Dominant
Near-Bank Stress
High**

Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

| | | | |
|---------------------------|------------------------|------------------------------|--|
| Stream: Taylor Run | | Location: BEHI #14 | |
| Station: 35 ft | | Observers: Biggs/Hepp | |
| Date: 3/29/18 | Stream Type: F4 | Valley Type: VI | |

| | | | | | |
|--|------------------|--------------------------|-----------------|------------------------------|-----------------|
| Study Bank Height / Bankfull Height (C) | | | | BEHI Score (Fig. 3-7) | |
| Study Bank Height (ft) = | 7.00 (A) | Bankfull Height (ft) = | 0.90 (B) | (A) / (B) = | 7.78 (C) |
| Root Depth / Study Bank Height (E) | | | | | |
| Root Depth (ft) = | 3.00 (D) | Study Bank Height (ft) = | 7.00 (A) | (D) / (A) = | 0.43 (E) |
| Weighted Root Density (G) | | | | | |
| Root Density as % = | 15.00 (F) | (F) × (E) = | 6.43 (G) | | |
| Bank Angle (H) | | | | | |
| Bank Angle as Degrees = | 70 (H) | | | | |
| Surface Protection (I) | | | | | |
| Surface Protection as % = | 0% (I) | | | | |

| | |
|---|---|
| Bank Material Adjustment: | |
| Bedrock (Overall Very Low BEHI) |  |
| Boulders (Overall Low BEHI) | |
| Cobble (Subtract 10 points if uniform medium to large cobble) | |
| Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand) | |
| Sand (Add 10 points) | |
| Silt/Clay (no adjustment) | |

| | | |
|---|--|----------|
| Bank Material Adjustment | | 5 |
| Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage | | 5 |

| | | | | | | | |
|-----------------|------------|-----------------|-------------|------------------|----------------|---|----------------|
| Very Low | Low | Moderate | High | Very High | Extreme | Adjective Rating and Total Score | Extreme |
| 5 – 9.5 | 10 – 19.5 | 20 – 29.5 | 30 – 39.5 | 40 – 45 | 46 – 50 | | |

Worksheet 3-12. Various field methods of estimating Near-Bank Stress (NBS) risk ratings to calculate erosion rate.

| Estimating Near-Bank Stress (NBS) | | | | | | | | | |
|---|------------------|--|-------------------------------|---|---------------------------|------------------------|---|--------------------------------|------------------------|
| Stream: Taylor Run | | | | | Location: BEHI #14 | | | | |
| Station: 35 ft | | | Stream Type: F4 | | | Valley Type: VI | | | |
| Observers: Biggs/Hepp | | | | | Date: 3/29/18 | | | | |
| Methods for Estimating Near-Bank Stress (NBS) | | | | | | | | | |
| (1) Channel pattern, transverse bar or split channel/central bar creating NBS | | | | | Level I | | Reconnaissance | | |
| (2) Ratio of radius of curvature to bankfull width (R_c / W_{bkf}) | | | | | Level II | | General prediction | | |
| (3) Ratio of pool slope to average water surface slope (S_p / S) | | | | | Level II | | General prediction | | |
| (4) Ratio of pool slope to riffle slope (S_p / S_{rif}) | | | | | Level II | | General prediction | | |
| (5) Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf}) | | | | | Level III | | Detailed prediction | | |
| (6) Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf}) | | | | | Level III | | Detailed prediction | | |
| (7) Velocity profiles / Isovels / Velocity gradient | | | | | Level IV | | Validation | | |
| Level I | (1) | Transverse and/or central bars-short and/or discontinuous.....NBS = High / Very High | | | | | | | |
| | | Extensive deposition (continuous, cross-channel).....NBS = Extreme | | | | | | | |
| | | Chute cutoffs, down-valley meander migration, converging flow.....NBS = Extreme | | | | | | | |
| Level II | (2) | Radius of Curvature R_c (ft) | Bankfull Width W_{bkf} (ft) | Ratio R_c / W_{bkf} | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| | (3) | Pool Slope S_p | Average Slope S | Ratio S_p / S | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| (4) | Pool Slope S_p | Riffle Slope S_{rif} | Ratio S_p / S_{rif} | Near-Bank Stress (NBS) | | | | | |
| | | | | | | | | | |
| Level III | (5) | Near-Bank Max Depth d_{nb} (ft) | Mean Depth d_{bkf} (ft) | Ratio d_{nb} / d_{bkf} | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| | (6) | Near-Bank Max Depth d_{nb} (ft) | Near-Bank Slope S_{nb} | Near-Bank Shear Stress τ_{nb} (lb/ft ²) | Mean Depth d_{bkf} (ft) | Average Slope S | Bankfull Shear Stress τ_{bkf} (lb/ft ²) | Ratio τ_{nb} / τ_{bkf} | Near-Bank Stress (NBS) |
| Level IV | (7) | Velocity Gradient (ft / sec / ft) | | Near-Bank Stress (NBS) | | | | | |
| | | | | | | | | | |
| Converting Values to a Near-Bank Stress (NBS) Rating | | | | | | | | | |
| Near-Bank Stress (NBS) ratings | Method number | | | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | | |
| Very Low | N / A | > 3.00 | < 0.20 | < 0.40 | < 1.00 | < 0.80 | < 0.50 | | |
| Low | N / A | 2.21 – 3.00 | 0.20 – 0.40 | 0.41 – 0.60 | 1.00 – 1.50 | 0.80 – 1.05 | 0.50 – 1.00 | | |
| Moderate | N / A | 2.01 – 2.20 | 0.41 – 0.60 | 0.61 – 0.80 | 1.51 – 1.80 | 1.06 – 1.14 | 1.01 – 1.60 | | |
| High | See | 1.81 – 2.00 | 0.61 – 0.80 | 0.81 – 1.00 | 1.81 – 2.50 | 1.15 – 1.19 | 1.61 – 2.00 | | |
| Very High | (1) | 1.50 – 1.80 | 0.81 – 1.00 | 1.01 – 1.20 | 2.51 – 3.00 | 1.20 – 1.60 | 2.01 – 2.40 | | |
| Extreme | Above | < 1.50 | > 1.00 | > 1.20 | > 3.00 | > 1.60 | > 2.40 | | |
| Overall Near-Bank Stress (NBS) rating | | | | | | Very High | | | |

**Dominant
Near-Bank Stress
Very High**

Worksheet 3-11. Form to calculate Bank Erosion Hazard Index (BEHI) variables and an overall BEHI rating. Use **Figure 3-7** with BEHI variables to determine BEHI score.

| | | | |
|---------------------------|------------------------|------------------------------|--|
| Stream: Taylor Run | | Location: BEHI #15 | |
| Station: 61 ft | | Observers: Biggs/Hepp | |
| Date: 3/29/18 | Stream Type: F4 | Valley Type: VI | |

| | | | | | |
|--|------------------|--------------------------|-----------------|-----------------|------------------------------|
| Study Bank Height / Bankfull Height (C) | | | | | BEHI Score (Fig. 3-7) |
| Study Bank Height (ft) = | 9.50 (A) | Bankfull Height (ft) = | 0.90 (B) | (A) / (B) = | 10.56 (C) |
| | | | | | 10.0 |
| Root Depth / Study Bank Height (E) | | | | | |
| Root Depth (ft) = | 8.00 (D) | Study Bank Height (ft) = | 9.50 (A) | (D) / (A) = | 0.84 (E) |
| | | | | | 2.3 |
| Weighted Root Density (G) | | | | | |
| Root Density as % = | 30.00 (F) | (F) × (E) = | | | 25.26 (G) |
| | | | | | 6.6 |
| Bank Angle (H) | | | | | |
| Bank Angle as Degrees = | 80 (H) | | | | |
| | | | | | 5.9 |
| Surface Protection (I) | | | | | |
| Surface Protection as % = | 5% (I) | | | | |
| | | | | | 10.0 |

| | | | | | |
|--|---|---------------------------------|----------|---|----------|
| Bank Material Adjustment: | | | | | |
| <ul style="list-style-type: none"> Bedrock (Overall Very Low BEHI) Boulders (Overall Low BEHI) Cobble (Subtract 10 points if uniform medium to large cobble) Gravel or Composite Matrix (Add 5–10 points depending on percentage of bank material that is composed of sand) Sand (Add 10 points) Silt/Clay (no adjustment) | <table border="1" style="width:100%; border-collapse: collapse; text-align: center;"> <tr> <td>Bank Material Adjustment</td> <td>5</td> </tr> <tr> <td>Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage</td> <td>5</td> </tr> </table> | Bank Material Adjustment | 5 | Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage | 5 |
| Bank Material Adjustment | 5 | | | | |
| Stratification Adjustment Add 5–10 points, depending on position of unstable layers in relation to bankfull stage | 5 | | | | |

| | | | | | | | |
|-----------------|------------|-----------------|-------------|------------------|----------------|---|------------------|
| Very Low | Low | Moderate | High | Very High | Extreme | Adjective Rating and Total Score | Very High |
| 5 – 9.5 | 10 – 19.5 | 20 – 29.5 | 30 – 39.5 | 40 – 45 | 46 – 50 | | 44.8 |

Worksheet 3-12. Various field methods of estimating Near-Bank Stress (NBS) risk ratings to calculate erosion rate.

| Estimating Near-Bank Stress (NBS) | | | | | | | | | |
|--|---|--|---|---------------------------|---------------------------|--|--------------------------------|------------------------|--|
| Stream: Taylor Run | | | | | Location: BEHI #15 | | | | |
| Station: 61 ft | | | Stream Type: F4 | | | Valley Type: VI | | | |
| Observers: Biggs/Hepp | | | | | Date: 3/29/18 | | | | |
| Methods for Estimating Near-Bank Stress (NBS) | | | | | | | | | |
| (1) | Channel pattern, transverse bar or split channel/central bar creating NBS | | | | Level I | Reconnaissance | | | |
| (2) | Ratio of radius of curvature to bankfull width (R_c / W_{bkf}) | | | | Level II | General prediction | | | |
| (3) | Ratio of pool slope to average water surface slope (S_p / S) | | | | Level II | General prediction | | | |
| (4) | Ratio of pool slope to riffle slope (S_p / S_{rif}) | | | | Level II | General prediction | | | |
| (5) | Ratio of near-bank maximum depth to bankfull mean depth (d_{nb} / d_{bkf}) | | | | Level III | Detailed prediction | | | |
| (6) | Ratio of near-bank shear stress to bankfull shear stress (τ_{nb} / τ_{bkf}) | | | | Level III | Detailed prediction | | | |
| (7) | Velocity profiles / Isovels / Velocity gradient | | | | Level IV | Validation | | | |
| Level I | (1) | Transverse and/or central bars-short and/or discontinuous.....NBS = High / Very High | | | | | | | |
| | | Extensive deposition (continuous, cross-channel).....NBS = Extreme | | | | | | | |
| | | Chute cutoffs, down-valley meander migration, converging flow.....NBS = Extreme | | | | | | | |
| Level II | (2) | Radius of Curvature R_c (ft) | Bankfull Width W_{bkf} (ft) | Ratio R_c / W_{bkf} | Near-Bank Stress (NBS) | <div style="border: 1px solid black; padding: 5px; text-align: center;"> Dominant Near-Bank Stress Very High </div> | | | |
| | | | | | | | | | |
| | (3) | Pool Slope S_p | Average Slope S | Ratio S_p / S | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| (4) | Pool Slope S_p | Riffle Slope S_{rif} | Ratio S_p / S_{rif} | Near-Bank Stress (NBS) | | | | | |
| | | | | | | | | | |
| Level III | (5) | Near-Bank Max Depth d_{nb} (ft) | Mean Depth d_{bkf} (ft) | Ratio d_{nb} / d_{bkf} | Near-Bank Stress (NBS) | | | | |
| | | | | | | | | | |
| (6) | Near-Bank Max Depth d_{nb} (ft) | Near-Bank Slope S_{nb} | Near-Bank Shear Stress τ_{nb} (lb/ft ²) | Mean Depth d_{bkf} (ft) | Average Slope S | Bankfull Shear Stress τ_{bkf} (lb/ft ²) | Ratio τ_{nb} / τ_{bkf} | Near-Bank Stress (NBS) | |
| | | | | | | | | | |
| Level IV | (7) | Velocity Gradient (ft / sec / ft) | | Near-Bank Stress (NBS) | | | | | |
| | | | | | | | | | |
| Converting Values to a Near-Bank Stress (NBS) Rating | | | | | | | | | |
| Near-Bank Stress (NBS) ratings | Method number | | | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | | |
| Very Low | N / A | > 3.00 | < 0.20 | < 0.40 | < 1.00 | < 0.80 | < 0.50 | | |
| Low | N / A | 2.21 – 3.00 | 0.20 – 0.40 | 0.41 – 0.60 | 1.00 – 1.50 | 0.80 – 1.05 | 0.50 – 1.00 | | |
| Moderate | N / A | 2.01 – 2.20 | 0.41 – 0.60 | 0.61 – 0.80 | 1.51 – 1.80 | 1.06 – 1.14 | 1.01 – 1.60 | | |
| High | See | 1.81 – 2.00 | 0.61 – 0.80 | 0.81 – 1.00 | 1.81 – 2.50 | 1.15 – 1.19 | 1.61 – 2.00 | | |
| Very High | (1) | 1.50 – 1.80 | 0.81 – 1.00 | 1.01 – 1.20 | 2.51 – 3.00 | 1.20 – 1.60 | 2.01 – 2.40 | | |
| Extreme | Above | < 1.50 | > 1.00 | > 1.20 | > 3.00 | > 1.60 | > 2.40 | | |
| Overall Near-Bank Stress (NBS) rating | | | | | | Very High | | | |

Worksheet 3-13. Summary form of annual streambank erosion estimates for various study reaches.

| Stream: Taylor Run | | Location: Project Reach | | | | | |
|---|---|--|---|---------------------|--------------------------------------|---|------------------------------|
| Graph Used: District of Columbia | | Total Stream Length (ft): 1295.0 | | | Date: 7/17/2018 | | |
| Observers: Biggs/Hepp | | Valley Type: VI | | | Stream Type: F4 | | |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Station (ft) | BEHI rating (Worksheet 3-11) (adjective) | NBS rating (Worksheet 3-12) (adjective) | Bank erosion rate (Figure 3-9 or 3-10) (ft/yr) | Length of bank (ft) | Study bank height (ft) | Erosion subtotal [[4]×(5)×(6)] (ft ³ /yr) | Erosion Rate (tons/yr/ft) |
| 1. BEHI #1* | High | High | 1.00 | 90.0 | 5.0 | 450.00 | 0.263 |
| 2. BEHI #2 | Extreme | High | 2.40 | 65.0 | 6.5 | 1014.00 | 0.819 |
| 3. BEHI #3* | Low | Low | 0.02 | 35.0 | 1.5 | 0.89 | 0.001 |
| 4. BEHI #4 | Very High | High | 1.00 | 70.0 | 8.0 | 560.00 | 0.420 |
| 5. BEHI #5* | Moderate | Low | 0.12 | 56.0 | 4.0 | 26.88 | 0.025 |
| 6. BEHI #6 | Very High | Very High | 1.70 | 73.0 | 4.5 | 558.45 | 0.402 |
| 7. BEHI #7 | Extreme | High | 2.40 | 110.0 | 10.0 | 2640.00 | 1.260 |
| 8. BEHI #8 | Extreme | High | 2.40 | 107.0 | 8.0 | 2054.40 | 1.008 |
| 9. BEHI #9* | Very High | Moderate | 0.50 | 26.0 | 8.0 | 104.00 | 0.210 |
| 10. BEHI #10* | Very High | Low | 0.40 | 26.0 | 8.0 | 83.20 | 0.168 |
| 11. BEHI #11* | Moderate | Moderate | 0.30 | 46.0 | 5.0 | 69.00 | 0.079 |
| 12. BEHI #12* | High | Low | 0.40 | 142.0 | 7.0 | 397.60 | 0.147 |
| 13. BEHI #13* | Moderate | Moderate | 0.30 | 84.0 | 4.0 | 100.80 | 0.063 |
| 14. BEHI #14 | Extreme | Very High | 3.20 | 35.0 | 7.0 | 784.00 | 1.176 |
| 15. BEHI #15 | Very High | Very High | 1.70 | 61.0 | 9.5 | 985.15 | 0.848 |
| 16. BEHI #16* | High | Low | 0.40 | 19.0 | 9.0 | 68.40 | 0.189 |
| 17. BEHI #17* | Moderate | Moderate | 0.30 | 89.0 | 5.5 | 146.85 | 0.087 |
| 18. BEHI #18* | Very High | Moderate | 0.50 | 71.0 | 7.0 | 248.50 | 0.184 |
| 19. BEHI #19* | High | Moderate | 0.50 | 90.0 | 6.0 | 270.00 | 0.158 |
| Sum erosion subtotals in Column (7) for each BEHI/NBS combination | | | | | Total Erosion (ft ³ /yr) | 10562.12 | |
| Convert erosion in ft ³ /yr to yds ³ /yr {divide Total Erosion (ft ³ /yr) by 27} | | | | | Total Erosion (yds ³ /yr) | 391.19 | |
| Dry Bulk Density of the Soil is 105 lb/cf. | | | | | Total Erosion (tons/yr) | 554.51 | |
| Calculate erosion per unit length of channel {divide Total Erosion (tons/yr) by total length of stream (ft) surveyed} | | | | | Total Erosion (tons/yr/ft) | 0.428 | |

* BEHI and NBS ratings were determined using ocular estimates and field calibration technique as described in Section 3.2